# NARRATIVE AND PROCEDURAL DISCOURSE FOLLOWING CLOSED HEAD INJURY

BY

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This study was undertaken to examine the ability to produce narrative and procedural discourse following closed head injury (CHI) and the relationship of discourse abilities to language and memory deficits. The subjects included 11 individuals who had sustained closed head injuries from vehicular accidents matched with 21 normal speakers of English by age, gender, education, and socioeconomic status.

The experimental tasks were designed to elicit two narratives and one procedural discourse from each subject. The three tasks consisted of telling a story based on a comic strip, retelling a story presented auditorily, and telling how to buy groceries. In addition, the Western Aphasia Battery was administered to the experimental subjects as an independent measure of oral language functioning, and tests of auditory verbal memory from the Wechsler Memory Scale were administered to both groups.

Three categories of variables were examined from the discourse data: productivity, content, and cohesion. The

results indicated that the discourse abilities of the two groups were significantly different, but that this difference varied for some measures from one task to another.

The CHI subjects demonstrated significantly reduced discourse productivity, i.e., reduced in quantity, speed of production, and efficiency. In both narrative and procedural discourse, these individuals produced significantly fewer words per discourse, spoke at a slower rate, and displayed more maze, or disfluent, behavior as compared to normal subjects. Additionally, there were significantly fewer instances of accurate content units and fewer cohesive ties per communication unit in their discourses. In narrative discourses, the CHI individuals displayed shorter communication units and more instances of inaccurate content as compared with normal speakers. In two of the three discourse tasks the CHI subjects exhibited a greater frequency of problems in clarity of reference.

An additional aspect of this pattern of reduced discourse was noted in the analyses for differences on the discourse measures between tasks for each group. The CHI subjects demonstrated little variation between tasks. However, the normal subjects generally performed differentially on the narrative tasks as compared to the procedural task. The results of this study bear importantly on what the content of language retraining should be for individuals who have sustained a closed head injury.

# CHAPTER I
# INTRODUCTION

In recent years the language phenomenon of discourse, a group of sentences that are related in some manner and treated as a unified whole, has received greater emphasis in studies of human communication. Attention has shifted from sentences to discourse as investigators attempt to explain language usage in its more naturally occurring form, i.e., discourse, and as they realize that man's linguistic competence does not stop at the sentence level. The literature contains an array of discourse comprehension and production theories from a variety of disciplines. Application of these theories in the form of discourse analyses has led to a better understanding of the discourse of normal speaking adults and adolescents. Linguists and speech-language pathologists have subsequently found these discourse analysis techniques beneficial in delineating the disordered communication skills of clinical populations. One population whose discourse has not yet been studied is the increasing group of individuals who have sustained a closed head injury (CHI). An analysis of the discourse of CHI patients would provide greater insight into the communication problems which result from CHI and would have significant implications for treatment.

## Review of the Closed Head Injury Literature

Closed head trauma is defined as a nonpenetrating blow to the head which results in an altered level of consciousness. In the majority of cases, the CHI is the result of a vehicular accident and the patient is under the age of 35. The neurological damage resulting from a CHI tends to be diffuse as opposed to the focal insults seen with open head injuries or cerebrovascular accidents (CVA). This diffuse damage is the result of the physical properties of the brain and the mechanical forces which disperse the blunt force of the impact over the entire brain. The brain is a mass of soft tissue which is bathed in cerebral-spinal fluid within a fixed space formed by the cranium.

The first force that operates on the brain when head trauma is sustained is the impact force, often called the coup effect. This results in damage to the cortical surface directly beneath the site of impact. Next, the impact force sets off a pressure wave which forces the brain against the opposite side of the skull, causing additional neurological damage. This is known as the contre-coup effect and can be the major site of injury in rapid deceleration injuries, such as falls. The third force is known as a shearing/stretching force and occurs regardless of the site of impact. Nerve fibers are stretched, resulting in widespread microscopic damage which cannot be fully appreciated on CT scans. Ommaya and Gennarelli (1974) demonstrated that the diffuse damage produced by "shear strain" (the pulling apart of axons and the

disruption of cell bodies) tends to be greater in areas where the brain rests against the bony prominences and rough surfaces of the cranium (i.e., the tips of the temporal lobes and the inferior aspects of the frontal lobes). Research has shown that even trivial head injuries can result in permanent microscopic neurological damage (Levin, Benton, & Grossman, 1982).

In addition to these impact forces, there are a number of potential secondary causes of diffuse injury. Swelling, or edema, is a frequent result of trauma and causes increased intracranial pressure. In addition, alterations in cerebral blood flow can occur, and hypoxia, or lack of adequate oxygen to the brain, is common in severe injuries. Finally, small vessels on the outer surface of the brain may have been torn open during the impact, resulting in accumulations of blood known as hematomas.

The consequences of CHI vary greatly with the extent and location of any focal brain damage. Due to the widespread nature of the damage, a multiplicity of behavioral, psychological, physical, sensory, and cognitive deficits is characteristic. Impulsiveness, disinhibition, distractibility, and emotional instability may be present and are related to damage of the prefrontal areas (Benton, 1979). Limb paralysis, ataxia, and dysarthria are common physical concomitants while sensory changes may be noted in smell, feeling, and vision. Despite the limitations that are imposed by physical impairments, research has indicated that it is the

cognitive and personality changes that are more likely to cause poor psychosocial adjustment than are the physical changes (Bond, 1975). Memory impairment is the most frequently reported cognitive change (Benton, 1979; McKinlay, Brooks, Bond, Martinage, & Marshall, 1981). Deficits in attention, verbal communication, and abstract reasoning are additional cognitive sequelae of CHI.

Traditional symptomotology patterns associated with the focally-produced aphasias are rarely found following CHI (Hagen, 1981; Levin, Grossman, and Kelly, 1976; Sarno, 1980). Heilman, Safran, and Geschwind (1971) identified only 13 cases of aphasia in their 750 patients who had sustained a CHI, or 2 percent of their CHI admissions. The nine subjects found to have anomic aphasia demonstrated impaired object naming with relatively spared oral language comprehension. The four found to have Wernicke's aphasia exhibited paraphasic or neologistic speech and impaired oral language comprehension. The mean age (57) of the CHI subjects was much higher than in other studies with CHI subjects, and six subjects had a history of alcoholism.

Despite the absence of traditional aphasia categories, studies have shown that even mild CHI often results in significant linguistic and cognitive impairments (Sarno, 1980; Levin, Grossman, Sarwar, and Meyers, 1981). Considerable disagreement exists, however, concerning the nature and name of the communication deficits found in this population. Thomsen (1975) employs the term amnestic aphasia and Sarno

(1980) speaks of "subclinical aphasia," whereas Halpern, Darley, and Brown (1973) prefer the term "the language of confusion." Yet all are referring to essentially the same phenomenon.

The linguistic deficits following CHI are similar to aphasia in several ways. The problem of <u>anomia</u> is prominent in both. Levin, Grossman, Sarwar and Meyers (1981) found that in 29 percent of their CHI patients, naming problems persisted even after the return of other language skills. The results of Sarno's (1980) study suggest that deficits in visual naming and word fluency exist whether the CHI is mild or severe. Numerous investigators report circumlocutions and paraphasic errors (Thomsen, 1975; Heilman, Safran, and Geschwind, 1971; Levin, Grossman, Rose, and Teasdale, 1979). However, "nonaphasic" naming errors are also a feature of CHI (Holland, 1982); confabulatory or stimulus-bound errors are often found in this population. Another similarity is that both aphasic and CHI individuals demonstrate problems with oral language comprehension initially, and for both groups, auditory comprehension abilities tend to recover more rapidly than other language abilities (Najenson, Sazbon, Fiselzon, Becker, and Schechter, 1978; Holland, 1982).

However, the linguistic problems following CHI differ from the characteristics of aphasia in very significant ways. Despite generally intact syntax, semantics, and phonology, especially at the single sentence level, CHI patients have difficulty in the <u>use</u> of language. Their conversational

speech has been described as "confused" (Groher, 1977;, Halpern, Darley, and Brown, 1973), confabulatory (Hagen, 1981), excessive (Heilman et al., 1971), full of irrelevant associations (Thomsen, 1975), tangential (Hagen, 1981; Levin, Grossman, Rose, and Teasdale, 1979), full of empty phrases (Heilman et al., 1971), and failing to display a logicosequential relationship between thoughts (Hagen, 1981). Unlike aphasic individuals, CHI patients have significant problems in the pragmatic aspects of language.

Yet it is becoming increasingly evident that the linguistic problems following CHI cannot be examined in isolation and that they are significantly different from the focally-produced aphasias. Indications are that the language problems are more likely to be manifestations of disturbance in the more general memory and cognitive processes that underlie communicative abilities (Hagen, 1981; Levin, Grossman, and Kelly, 1976; Groher, 1977; Holland, 1982).

Although aphasia may be a consequence of CHI in a small percentage of the patients, for the majority of the cases, the term "aphasia" is not helpful in referring to the linguistic problems following CHI and should be avoided. Their communication deficits should be interpreted in light of the concomitant behavioral and cognitive problems, particularly memory deficits. Labeling them as having aphasia implies that traditional aphasia batteries and therapeutic techniques are to be employed. However, aphasia tests do not adequately assess the areas where CHI patients are more likely to

experience difficulty, that is, in the areas where language and cognition intertwine (e.g., the organization of language, discourse abilities, pragmatic aspects of communication, and the use of language for problem solving and abstract reasoning). Appropriate rehabilitation measures cannot be devised unless the true areas of deficit are identified and addressed.

Only a few studies have examined the expressive language problems following CHI, and the ones that do exist have been limited in their scope. All but three studies restricted their measures of oral expression to confrontation naming, word association fluency, and sentence repetition. Thomsen (1975) reported her tasks as including not only the above measures but also picture descriptions, antonyms and synonyms, and explanations of metaphors. The results, however, were reported only in descriptive terms and in terms of the presence or absence of aphasia and associated syndromes. Najenson et al. (1978), examining long-term recovery of communication, used a variety of language tasks but reported the results only in the form of percentiles on a graph by modalities, e.g., auditory comprehension, oral expression, and reading. All patients had extremely severe injuries, with the median period of coma being approximately two months. Groher (1977) administered the Porch Index of Communicative Abilities (PICA) to 14 CHI patients at thirty-day intervals for 120 days. The PICA contains four oral expressive subtests under the Verbal output modality. Three require only single word

responses whereas one subtest requires the generation of a complete sentence. A numerical score is obtained for each item in a subtest, but scores may be lowered by slowness in responding or articulation errors, not just by errors in semantics and syntax.

Even when investigators have concluded that specific linguistic deficits (e.g., anomia) have resolved, or when the patient's talking is judged by others to be relatively normal, deficits in communication at the discourse level may exist. Thomsen (1975) stated that 4 of her 12 patients with aphasia following CHI had no symptoms of aphasia at follow-up (12 to 50 months after injury). Yet one of these patients was reported to exhibit many repetitions of words and false starts of sentences in his spontaneous speech. Groher's (1977) 14 subjects had no naming problems and all subjects were considered by their family and by hospital staff to have "normal" comprehension and verbal skills by the fourth month following CHI. However, Groher noted that 9 of the 14 subjects carried on conversations which were inappropriate in length, confused in content, and often irrelevant to the discussion. The patients continued to demonstrate poor organizational and retention skills despite their seemingly "normal" language performance, and this produced a devastating effect on their everyday lives.

A need exists, therefore, for an examination of the linguistic skills of CHI patients beyond the sentence level, particularly in the areas where language and cognition

interplay and where pragmatic issues are involved. Discourse would be an appropriate level of investigation for several reasons. First, if subtle language problems do exist, they would more likely be demonstrated at the more demanding production level of discourse than at the sentence level. Secondly, disorganized cognitive processes may cause a disruption in the orderly arrangement of the semantic content of a discourse. Semantic dependencies become more crucial than syntactic dependencies when moving from the sentence to the discourse level, and the semantic structure of a discourse is constructed on a larger hierarchical scale (de Beaugrande, 1980). Thirdly, extralinguistic factors are more likely to affect the production of discourses than they would single sentences. Cognitive factors, such as attention, memory capacity, and formulation of goals, determine many aspects of discourse production. Social and psychological factors must also be considered since social conventions and the emotional state and interests of the communication partners influence the usage of discourse. Lastly, discourse analyses permit the study of language in the form most commonly used in everyday life. CHI patients often perform at near normal levels on structured tasks but experience problems functioning in everyday social settings.

An analysis of the discourse of CHI patients would be beneficial to the speech-language pathologist for several reasons. It would allow greater specificity in characterizing the aberrant features of discourse which have been previously

described only in general terms. It could guide therapeutic intervention and provide a measure of effectiveness of treatment. By examining oral language abilities, memory skills, and discourse performance, greater insight into the relationships between cognitive, linguistic, and neurological factors would be gained.

In order to approach the area of discourse analysis, one must first understand what constitutes normal discourse and how discourse has been analyzed in previous studies with clinical populations. A review of these two bodies of literature follows.

## Review of Literature on Normal Discourse

Theories of discourse comprehension and production have arisen from several disciplines, including linguistics, psychology, philosophy, and artificial intelligence. Approaches to the analysis of the discourse of normal speaking adults have varied greatly, depending upon the focus, interest and background of the author. Sorting through the technical terms, one quickly realizes there is no universal way of dealing with the phenomenon of discourse.

Winograd (1977) proposed four distinctions that are useful when determining the domain of discourse theories and analyses. The first distinction is intersentential versus intrasentential aspects of an analysis. An analysis of syntax is generally an intrasentential analysis. Acceptability of sentences is generally a matter of the degree of

grammaticality. The same is not true for discourses. In discourses, many aspects of communication must be combined so that the speaker produces linguistic output which is appropriate for the situation and is sensible to his communication partner. The term coherence refers to that property by which acceptability of a discourse is judged. Frederiksen (1977) defined coherence as the property that makes a discourse more than just a collection of unrelated simple sentences. Coherence is achieved by conforming to a set of commonly and intuitively accepted rules of production and functions to insure the adequate transfer of information from the speaker to the listener (Scinto, 1977). Just as there are degrees of grammaticality of sentences, there are degrees of acceptability of discourse coherence. An elaboration on the notion of coherence will be presented later.

The second distinction proposed by Winograd is between monologic and dialogic discourse. Speech act theories, such as that of Searle (1969), primarily address issues regarding spoken dialogues, or conversations. The types of analyses employed under these theories generally are pragmatic analyses. Turn-taking has been explored in some studies while in others elements of a conversation are analyzed by their function, or the way the speaker intends the utterance to be taken independent of the syntactic form or the literal meaning. Within any dialogue, however, one speaker may

actually carry on a monologue, and speech act theories do not examine many important aspects of monologic discourse.

The third distinction is between spoken and written forms of discourse. Differences exist between the two forms of expression as noted by several investigators (de Beaugrande, 1982; Ochs, 1979; Tannen, 1982). In the more recent literature the term text is more commonly used for designating written discourse.

The last distinction to be made when viewing discourse is between context-dependent and context-independent discourse. The term context here means the situation rather than the verbal context. The discourse of children and "neighborhood" speech tend to be context-dependent (Halliday and Hasan, 1976), i.e., the setting and participants must be known in order to interpret the discourse properly.

Since the focus of the present study is on the oral expressive language abilities of CHI patients under controlled conditions, the remainder of this review of discourse literature is limited to issues involved in spoken monologic discourse which is relatively context-independent; that is, the setting of the discourse and the time of its actual occurrence are not crucial to its understanding. The discourse tasks in the current study are context-dependent in that the content is determined by the stimuli presented and performance is judged based upon this restriction.

One approach to the analysis of monologic discourse has been to devise taxonomies. Five discourse genres presented by Graesser (1978, 1981) are

1. Descriptive--generally consists of a list of static concepts, attributes and relations.
2. Expository--describes something and explains why it is that way. Example, encyclopedia article.
3. Narrative--conveys actions and events that unfold in time. Example, fairy tale.
4. Persuasive--the laying out of a reasoning sequence. Examples, debate, sermon, advertisement.
5. Procedural--tells how to perform a certain task by listing the steps in a logical sequence. Example, directions on how to use a machine.

Linguists who use a transformational grammar approach focus on syntax and on language as a context-free system. They have attempted to capture the regularities of discourse structure by devising a "discourse grammar." Rules for generating the string of sentences of a discourse were proposed for each discourse genre. Labov (1972), a follower of this approach to discourse analysis, stated that a well-formed narrative should include the following parts:

1. Abstract--summarizes the whole story.
2. Orientation--sets the scene, usually at the beginning but may be spread out.
3. Complicating action.
4. Evaluation--the point of the narrative.

5. Result or resolution.

6. Coda--signals the end of the narrative.

The structure of procedural discourse includes an optional statement of the goal and the setting, followed by an ordered set of essential steps and possibly subordinate steps, and finally an optional coda (Graesser, 1978; Ulatowska, North, and Macaluso-Haynes, 1981).

The use of discourse grammars has merit but has been criticized as a method for discourse analysis for several reasons. As Levy (1979) pointed out, the purpose of a discourse is to convey a certain meaning not a particular grammar. A discourse is generally accepted as being a unit of language usage or a semantic unit rather than a grammatical unit (Halliday and Hasan, 1976). There are many other aspects of a well-formed discourse that are not captured by this approach. In addition, Mandler (1982) stated that story grammars are inadequate for explaining individual differences in reading comprehension and recall of narratives. They are only one representation in memory, and they cannot account for all aspects of processing stories.

Another approach to the problem of studying discourse is the cognitive processing approach, where one attempts to understand the cognitive structures and processes of language users. One follower of this approach, Winograd (1977), examined what we know about the information conveyed in a discourse and the knowledge that listeners and speakers bring to the communication setting that allows them to produce and

understand well-formed discourses. This knowledge is posited to be organized in memory as units of concepts, known as <u>schemata</u> (Winograd, 1977) or <u>frames</u> (van Dijk, 1977). These mental structures represent abstract knowledge of typical activities or situations, components of the activity, and relations between the components and function to guide the structuring of the comprehension and production processes. The three categories of schemata outlined by Winograd are

1. Knowledge of objects, events, and abstractions.
2. Knowledge of communication situations.
3. Knowledge of patterns of discourse.

The first category consists of our general knowledge of our environment and common situations. It includes the understanding of time, space, causality, goals, and plans, as well as inanimate objects. These schemata allow us to understand the objects, events, and ideas that are being discussed.

The second category consists of a large and diverse set of schemata which deal with the process of natural language communication. This communication situation knowledge can be divided into three subcategories. The first subcategory, entitled pragmatic context schemata, encompasses the issues referred to as <u>deixis</u> (literally means pointing). Deictic terms incorporate the physical and social situation of the speaker and listener and serve to 'point out' time, space, person, and relative social status to the communication

partners. These are the aspects of language that are the most difficult for non-native speakers to acquire.

Fillmore (1975) described four types of deixis: person, place, time, and social. Person deixis marks the participant roles in a conversation, generally through the use of pronouns. The speaker refers to himself as I, to the listener as you, and to nonparticipants in the third person. The major contrast is between speaker and nonspeaker, but a proximal/distal distinction is made in the use of we/they. Place deixis involves the use of the participants in a conversation as spatial reference points. Selection of this/that and here/there requires a proximal/distal distinction relative to the speaker. Come/go and bring/take involve both the listener and speaker's viewpoint and position in space. Time deixis orients the conversation in time. The time of the utterance is the point of reference for marking the temporal aspects of events being discussed. Verb tenses and adverbs such as now, yesterday, and shortly, are deictic expressons in English. Social deixis consists of devices for identifying the social relationship between the conversation participants. It includes the selection of titles, the degree of politeness, and the use of direct versus indirect commands.

The second subcategory of our knowledge of communication situations consists of those schemata for determining the cognitive state of the communication partner. The speaker must form a model of what information his listener knows, what is in his active memory, and what is in the focus of

attention. The third subcategory is knowledge of the psychological context, which includes the point of view and the emotion conveyed by the discourse. A speaker must establish and maintain a consistent viewpoint, or a focus with which he wants the listener to identify. Deictic terms are used to establish point of view in a visual sense. In addition, primary emphasis is placed on one character or another when telling a story, creating a focus for the listener's empathy. More will be said about these later.

Knowledge of patterns of discourse is the third major type of schema, according to Winograd. Conventions for interpersonal interactions are one subset of these schemata. Conversational partners understand "How are you?" to be a convention of polite discourse, not a request for information on their health. Questions such as "Can you reach the light switch?" are interpreted as requests for action. Grice (1975) proposed several global rules for cooperative conversation. The rules or strategies followed by speakers seem to be:

1. Be informative but do not give more information than is required.
2. Say only what you believe to be true.
3. Be relevant.
4. Avoid obscurity and ambiguity.
5. Be brief and orderly.

Widdowson (1978) found strategies of the listener to include:

1. Assume the speaker has something informative to convey.
2. Relate what is said to what you already know.
3. Assume that if one thing is said after another, the two are related in some way.
4. Assume that something expressed in a subordinate sentence is intended to be less important than that expressed in the main sentence.

A second subset of schemata of discourse patterns encompasses rhetorical schemas. These include conventions for outlining the reasoning sequence which the speaker wants the listener to follow. Conjunctions, such as therefore and because, and juxtaposition of parallel sentence constructions serve to signal this sequence. On a larger scale, there are fixed conventions for the outlining of reasoning in lengthy discourses such as professional journal papers.

A third subcategory of knowldege of patterns of discourse is that of conventional structures for narratives. Each culture has its own set of schemata for relating stories. Many are those of common sense and knowledge of time sequence, plans and causality. The story grammar of narratives, such as the previously mentioned one proposed by Labov (1972), is part of this knowledge.

While understanding the acquired rules and concepts called upon in the process of discourse comprehension and production allows us to look at many aspects of language

development and learning, the interest at the present is on the traces which remain following these cognitive processes, or the actual discourse itself. Therefore, a text-based approach is more applicable; the emphasis here is on the organization of the discourse, how the sentences relate to one another, and the context and purpose of the discourse.

### Coherence

The term coherence has to do with the organization, or the well-formedness, of a discourse. As previously stated, coherence is the property that ties together the meanings in a discourse, thereby making it sensible. Semantic consistency and continuity are the primary means of achieving coherence. Communication partners draw upon their schemata to produce coherent discourses. Language users can generally distinguish between a discourse and a collection of unrelated sentences (Halliday and Hasan, 1976). However, specifying the factors crucial to making that distinction is not easy. One of the major objectives of discourse studies has been to identify these factors.

It is generally agreed that the primary requirement for coherence is the maintenance of a theme or topic (Sopher, 1979; Scinto, 1977; Kintsch and van Dijk, 1978). All the utterances within a discourse must be related to the topic. Irrelevant or false information interferes with the semantic connectivity and violates pragmatic rules of discourse. Any

digression from the topic must be marked by phrases such as "Oh, by the way. . . ."

It is not sufficient, however, just to recite sentences related to a topic; there must also be some point to the discourse as a whole (Cooper, 1982; van Dijk, 1977). Information on the topic must be evaluated as to its contribution to the overall meaning of the discourse (Scinto, 1977).

The manner in which the content is organized, or the overall semantic structure, is also an important factor in coherence. Several ways have been proposed to analyze how the message moves forward in a discourse. On a global level, the logical sequencing of the main events or elements is important. The ordering of elements serves to indicate the structure of thought of the speaker, indicating how one event leads to another (Brooks and Warren, 1979). There are several ways to organize a discourse in a logical order. In a narrative, the temporal sequence is critical, whereas a spatial framework would be more crucial in a descriptive discourse. Of course, the omission of major events or elements would interfere with the semantic continuity and thus lower the coherence of a discourse.

On a finer level of analysis, several theories have outlined the forward movement of the content structure. Propositions, or informational units, are organized by the Given-New principle, according to Clark and Haviland (1977): That which is known is presented first, and the new

information is attached to the given. In addition to the ordering of the propositional elements with given first and new second, contrastive stress is used to mark new information. The topic-comment scheme (van Dijk, 1977) and rheme-theme notion (Danes, as cited in Scinto, 1977) are similar to the Given-New idea. Kintsch and van Dijk, (1978) present a slightly different approach to the same concept. Propositions, in their writings, specifically consist of two components, a predicate (generally a verb) and at least one argument (either a concept or another proposition). A text is said to be coherent at the microstructure level if there is overlap, or repetition, among the arguments.

A consistent point of view is also a factor in ensuring conceptual, or semantic, continuity. As discussed earlier, the speaker must present a dominant, overriding viewpoint, marking any digressions from the established viewpoint clearly with statements such as "John feels . . ." or through use of direct or indirect quotations. A more subtle aspect is the literary point of view previously mentioned, whereby the narrative establishes a perspective determined by the identity of the narrator and his relation to the action. The narrator establishes identity with one of the characters in a story in order to focus empathy. Generally, the reader or listener finds it easier to identify with the subject of a narrative statement and assume that character's point of view. For example, in the sentence "David talked to his wife," the narrator identifies with the character David, but in "Sharon's

husband talked to her," the narrator identifies with the character Sharon. A sentence cannot contain two different foci of the narrator's empathy. Thus the sentence "Sharon's husband talked to his wife" would be unacceptable since the narrator's empathy is initially with Sharon, but subsequently shifts to David (Black, Turner, and Bower, 1979).

Deictic terms are the linguistic forms which help establish and maintain a consistent point of view in a narrative in terms of marking the narrator's relation to the action (Black, Turner, and Bower, 1979). For example, in the sentence "The cafeteria door opened and the children came in," we know that the narrator is inside. Research has shown that people prefer short narratives which display a consistent point of view, and they rate them as being more comprehensible (Black, Turner, and Bower, 1979).

Verb usage is a factor which contributes to coherence in several ways. We have seen how verb tenses serve to anchor the elements of a discourse in time and place (a deictic function). In addition, the consistent use of the same tense for the main verb of each sentence within a discourse aids to coherence, or what Hendricks (1973) terms "intersentence concord." van Dijk (1972) considers verb tense, mode, and aspect to be factors in tying sentences together in a coherent manner. Another way verbs influence coherence is in terms of the verb-related inferences made by the listener (Haberlandt and Bingham, 1978). Stored with the meaning of verbs are

associated components, such as the likely consequences of the action, appropriate settings, and agents for such action.

An aspect of spoken discourse which appears to be related to coherence is fluency. The notion of fluency connotes an ease in expressing oneself in a smooth, even flow of speech such as that of skilled public speakers (Loban, 1976). The presence of behaviors such as hesitations, filled pauses, false starts, and nonfunctional repetitions in speech creates discontinuity, reducing the speaker's communicative efficiency and thus the coherence of the discourse (Berger and Sinoff, 1978). Instances of this behavior have been labeled as disfluencies (Berger and Sinoff, 1978), "garbles" (Hunt, 1964), "mazes" (Loban, 1976; Golper, Thorpe, Tompkins, Marshall, and Rau, 1980) and "remnants" (Hass, 1967). The terminology that will be adopted for this study is Loban's (1976) concept of mazes. Loban suggests that the presence of mazes is a universal phenomenon which reflects difficulty in putting thoughts and feelings into words, or a problem in verbal planning. Situational variables, such as relative status of the listener, physical well-being of the speaker, and stress, are known to influence the presence of mazes, according to Loban.

Studies with adult aphasic speakers indicate that the number of instances of mazes is a major variable differientating their speech from that of normal speakers (Kreindler, Mihailescu, and Fradis, 1980; Golper et al., 1980; Yairi, Kintautas, and Arent, 1981). A significant correlation

between linguistic complexity and disfluency has been found in children (Haynes and Hood, 1978). Therefore, individuals experiencing difficulty with the increased load on the linguistic processing system placed by the task of discourse production would possibly have more instances of disfluency.

## Cohesion

The term cohesion refers to the linguistic features of the surface structure of a discourse which establish connectivity and ensure the detection of the propositional development. Cohesion is another facet of coherence in that it facilitates the detection of coherence, should it be present. However, the presence of cohesion does not guarantee coherence. Cohesive ties link the meaning of sentences, thus creating what Halliday and Hasan (1976) call "texture." Cohesion exists, according to Halliday and Hasan whenever "the interpretation of any item in the discourse requires making reference to some other item in the discourse" (1976, p. 11). Several examples of cohesive ties (underlined) between sentences are found in these sentences:

Jim lost his keys. Or, at least he thought he did.

The conjunction or links the meaning of the two sentences in that it indicates that the second sentence will contradict the first. The personal pronoun he is a reference back to John, and did substitutes for the verb portion of the first sentence (lost his keys).

There are several taxonomies of cohesion (Halliday and Hasan, 1976; Gutwinski, 1976; de Beaugrande, 1980). The taxonomy that has been most widely used in discourse analyses (Rochester, Martin, and Thurston, 1977; Wykes and Leff, 1982; Shekim, 1983) and the one selected for this use in this study is from Halliday and Hasan's (1976) Cohesion in English.

As already stated, Halliday and Hasan (1976) emphasize that a text, or discourse, is a unit of meaning. In their model of language production they state that language is organized so that overall meaning is coded into forms through the choice of vocabulary and grammatical structures. There is no clear distinction between vocabulary and grammar although the more general meanings are felt to be "expressed through the grammar and the more specific meanings through the vocabulary" (1976, p. 5). Similarly, cohesive ties are semantic relations that are realized as forms; some are grammatical forms while others are lexical forms. Halliday and Hasan divide cohesive devices into five major categories: reference, substitution, ellipsis, conjunction, and lexical cohesion. The first three are realized through the grammatical system and the last type through the lexical system. Conjunction ties, though mainly grammatical, have a lexical component in them. These categories will be defined more completely in Chapter Two.

Cohesion is a more formal discourse device, according to Ochs (1979), which is acquired late in language development and at least partially through formal education. It is a

means of providing temporal, spatial, and logical orientation for the hearer, allowing him or her to connect each utterance with what has come before. An analysis of the cohesive elements of a discourse would not so much help in the interpretation of the discourse as it would in explaining why the discourse was interpreted in a certain way, or more importantly, why the interpretation was ambiguous. It would help explain the inferences that the speaker requires his listener to make.

In addition to the factors already discussed, there are other pragmatic and sociological issues involved in the production of a coherent discourse. The discourse must be coherent given the context of the situation, i.e., it must be related to the goal established and must meet the stylistic requirements of the setting. The semantic structure must be modified according to the social strata of the listener (van Dijk, 1972). In addition, suprasegmental features of speech, such as the relative stress placed on each word in a sentence and the overall intonation pattern, contribute to cohesion and coherence.

In summary, this review of the linguistic literature offers guidelines as to what constitutes a coherent discourse that can be applied to analyses of the discourses of communicatively-impaired individuals. Next, research conducted to this date on the discourse of such populations will be reviewed.

## Review of Literature on Disordered Discourse

### Schizophrenic Subjects

Schizophrenic discourse is of interest because the same adjectives have been used to describe it as those used with CHI discourse: incoherent, vague, and rambling. Using the classification system devised by Halliday and Hasan (1976), Rochester, Martin and Thurston (1977) compared the number and type of cohesive ties in the conversations of three groups of subjects: thought-disordered schizophrenic patients, non-thought-disordered schizophrenic patients, and normal speaking adults. Schizophrenic patients as a whole were found to use less cohesion than normal speakers. The thought-disordered schizophrenic speakers used fewer conjunctions but more instances of lexical cohesion to form cohesive ties than the other two groups. Lay listeners judged the discourse of the thought-disordered schizophrenic patient to be loosely connected and slightly difficult to follow. The authors tie the results together by stating that conjunction links, in their opinion, form stronger intersentential ties than do lexical ties: Conjunction links express logical relations between sentences whereas lexical ties are accomplished through single words. Despite the increased difficulty for the listener, the discourses of the thought-disordered schizophrenic were not deemed to be, as a whole, incoherent.

Wykes and Leff (1982) also used Halliday and Hasan's categories of cohesion and analyzed the number of structural links found in the discourse of schizophrenic subjects compared with that of manic subjects. Manic patients were found to use more cohesive ties per sentence unit in their conversation than schizophrenic patients, supporting the authors' clinical observation that the speech of manic patients is easier to understand.

While analysis of cohesive devises does provide additional insight into the connectivity of discourse in these groups of patients, it is not a complete study of discourse. As Wykes and Leff (1982) point out, cohesive links are primarily structural links, and counting their presence does not measure the meaning. One might criticize the decision by Rochester et al. (1977) to select only the most thought-disordered sections of the speech samples to analyze.

Language-impaired Children

Berger and Sinoff (1978) explored the semantic content and several aspects of "cohesion," including fluency, verb usage, pronoun usage, and logical sequence, in the narrative discourse of language-impaired children between the ages of eight years, four months and nine years, six months. Cohesion was defined as "the relation of meaning expressed in discourse and the appropriate linking of these relationships" (1978, p. 3). In this study the children retold stories they had either seen on a film or heard on a recording to a naive listener.

Significant differences between the control group of normal children and the language-impaired group occurred on the measures of logical sequence, fluency, and use of ambiguous pronouns. The language-impaired children tended to use fewer complex verb tenses and a smaller variety of tenses. They used more nonindexed pronouns, appearing to rely on presupposed knowledge shared by listener and speaker. Though not directly analyzed in this study, the authors observed that the language-impaired children exhibited less-developed noun phrases ("the man" instead of "the man with the straight hair"), less variety in their vocabulary, and generally shorter narratives.

Cognitive, linguistic and social factors were proposed to account for the differences between the two groups. The researchers identified two modes of style in the narratives of the experimental subjects characteristic of the egocentric language found in younger children. These two modes were juxtaposition and syncretism. The experimental subjects tended to list events and did not link them in the appropriate causal, temporal or logical relationship. Since the experimental subjects, based on their chronological ages, were past the stage of "egocentricity," Berger and Sinoff felt this suggested that some form of cognitive immaturity or delay could account for their performance. Linguistic factors undoubtedly accounted for part of the results, the authors reported, since discourse places a greater demand on an individual's linguistic processing ability than does sentence

production. The frequency of disfluency in children is known to be related to linguistic complexity (Haynes and Hood, 1978). Social factors such as role-playing ability are a part of communication competence. The speaker must be able to keep the listener's role in mind while communicating with him. It was suggested that one explanation for the more frequent use of ambiguous pronouns by the experimental group than by the control group might be the former's inability to assume another individual's role.

## Aphasic Patients

The discourse of aphasic individuals has been investigated from several angles. For years, the majority of the research focused on the fluency of oral production as it relates to classification of aphasia. Studies by Goodglass, Quadfasel, and Timberlake (1964); Benson (1967); and Wagenaar, Snow, and Prins (1975) have confirmed that fluency is a major dimension for the classification of aphasia. The fluent-nonfluent dichotomy was originally based on (a) the rate of speech (number of words per minute) and (b) the utterance length (Wagenaar, Snow, and Prins, 1975). Kreindler, Mihailescu, and Fradis (1980) demonstrated that the total speaking time and the total number of words produced must also be considered when making the fluent versus nonfluent distinction. It is of interest that the subjects in this study all had post-traumatic aphasia. Eight had received a closed head injury while the rest had open wounds.

Using a slightly different approach, Yairi, Kintautas, and Arent (1981) tallied the instances of disfluency found in the spontaneous speech of patients with Broca's aphasia, nonaphasic patients with left hemisphere lesions, patients with right hemisphere damage, and normal speakers. The aphasic (Broca's) individuals were three times more disfluent than normals or nonaphasic brain-damaged patients.

Prins, Snow, and Wagenaar (1978) elicited two minutes of expository discourse from their aphasic subjects and scored the results on 28 variables. Their measures focused primarily on speech fluency, word selection errors, grammatical errors, and a type-token count. Their measures were designed primarily to detect differences between fluent and nonfluent aphasic subjects and the rate of recovery of spontaneous speech. The measures do not tell us anything about the content or coherence of the conversation produced.

Recent studies have attempted to remedy this oversight. Yorkston and Beukelman (1977, 1978, 1980) investigated not only speech fluency but also the efficiency of communication. Using the "Cookie Theft" picture from the Boston Diagnostic Aphasia Examination (Goodglass and Kaplan, 1972), they elicited expository discourse from mildly to moderately aphasic individuals, normal adults, and normal geriatric speakers. The measure of efficiency, the number of content units communicated per minute, was found to be inversely related to the severity of aphasia (Yorkston and Beukelman, 1980). The number of content units produced did not

differentiate the normal, geriatric, and mild to moderate aphasic groups, although it did differentiate the mildly aphasic and moderately aphasic groups. The aphasic subjects, however, were not as efficient in their communication. They took longer to express the same number of concepts and, in the case of the fluent aphasics, used more words.

Golper, Thorpe, Tompkins, Marshall, and Rau (1980) examined the expository discourse of 10 mildly aphasic individuals with 10 right hemisphere damaged persons and 10 normal geriatric speakers. As in the work of Yorkston and Beukelman (1977), the "Cookie Theft" picture was employed, and the measures of concepts, syllables per minute, concepts per minute, and mean length of utterance were computed. The results were similar to those of Yorkston and Beukelman (1977) in that the aphasic speakers did not differ significantly from the control subjects in terms of the number of concepts produced but did differ in the concept rate. The aphasic individuals generated fewer concepts per minute than did the other two groups. No significant difference was found between the right hemisphere patients and normal subjects on this measure. All three groups were significantly different in their mean length of utterance string and syllable rate. The aphasic subjects had the most depressed scores, but the right hemisphere damaged subjects did not reach the level of the normal subjects' performance.

Golper et al. (1980) also measured "performance deviations" by adapting Loban's (1976) categories of mazes.

The error categories tallied by Golper et al. (1980) were (a) phrase interruptions or revisions, (b) word interruptions or revisions, (c) sequence interrupters in phrases, (d) morpho/syntactic deviations, and (e) phonemic errors. The results indicated that the discourse of mildly aphasic patients contained more instances of each type of performance deviation than did the speech of either nonaphasic right hemisphere damaged patients or geriatric normal speakers.

Berko-Gleason, Goodglass, Obler, Green, Hyde, and Weintraub (1980) examined the narrative style of moderately severe aphasic patients. Five subjects with Broca's aphasia, five with Wernicke's aphasia, and five normal speakers were asked to retell stories they had heard or read while looking at a series of pictures depicting the story. The number of themes, or content units, produced as well as lexical and syntactic measures for each group were compared.

As expected, the Broca's subjects used fewer words in their narratives than did the other two groups. Both aphasic groups produced significantly fewer of the designated key words and main themes. They used one fourth as many target lexemes as the normal group. The narratives of Wernicke's aphasic subjects contained one half the themes found in the stories of normal speakers. About 85 percent of the pronouns used by aphasic subjects had no antecedent. The use of deictic terms such as <u>this</u>, <u>that</u>, <u>here</u>, and <u>there</u> was tabulated as a measure of indefiniteness. The narratives of Wernicke's subjects were found to contain a higher percentage

of deictic words as compared to the narratives of Broca's and normal-speaking subjects. Syntactic organization could only be measured in Wernicke's subjects because the Broca's aphasic individuals did not produce enough full sentences for analysis. It was found that Wernicke's patients used fewer complex constructions than normal-speaking adults and were more likely to use simple concatenation (and) to join clauses. Normals had three times as many instances of embedding by temporal conjunction and twice as many instances of relative clauses. Normals were more likely to indicate semantic bonds between sentences through use of disjunctive (but, or) or causal (so, because) conjunctions.

A series of studies by Ulatowska and her associates (Ulatowska, North, and Macaluso-Haynes, 1981; Ulatowska, Doyel, Freedman-Stern, Macaluso-Haynes, and North, 1983; Ulatowska, Freedman-Stern, Doyel, Macaluso-Hayes, and North, 1983) has given additional insight into the discourse abilities of aphasic speakers. Each study has attempted to characterize aspects of both sentential grammar (length of clauses and use of embedding) and discourse grammar (length in terms of number of words and inclusion of elements of discourse superstructure) in the procedural and narrative discourse of aphasic adults.

The narrative tasks were (a) telling a story based on five sequenced line drawings, (b) retelling a fable read by them or to them, and (c) telling about a memorable experience. The procedural discourses were generated by asking the

subjects to tell how to perform everyday activities, such as brushing their teeth and combing their hair, and familiar but infrequently performed activities, such as bowling and changing a tire. As a measure of content for the narratives, elements of a well-formed narrative, as proposed by Labov (1972), were examined. The procedural discourses were analyzed for the elements of (a) introduction, (b) essential steps, and (c) coda.

Ulatowska et al. (1981) explored the ability of ten mildly aphasic individuals to generate narrative and procedural discourse. Although the aphasic subjects were found to produce all the important elements of narrative and procedural discourse superstructure, they produced less language and less complex language than normal speakers in all tasks. Aphasic subjects reduced the amount of information given by using fewer steps within each procedure and less evaluation in the narratives. Both aphasic and normal speakers used simpler language in procedural discourses. In the sentential analysis, the aphasics were shown to use less embedding, fewer adverbial modifiers, and more indefinite words.

Three-point rating scales were used to evaluate the quality of content and clarity of language. The authors felt the former would provide a measure of coherence while the latter would be a measure of linguistic cohesion. The aphasic speakers were rated lower on both scales than normal speakers.

A qualitative analysis of errors revealed difficulties were experienced by the aphasic patients with cohesive links, deictic terms, verbs, and conjunctions. However, normal speakers exhibited the same types of errors, just not as many as the mildly aphasic speakers.

Ulatowska, Doyel, Freedman-Stern, Macaluso-Haynes, and North (1983) extended the earlier study by examining the ability of 15 moderately aphasic individuals to produce procedural discourse. Once again, a reduction in the amount and complexity of language was found with the aphasic speakers. They produced shorter discourses and less complex sentences. They gave fewer essential steps and less optional information. The chronological sequence of steps was accurate, but errors were found in marking reference (ambiguous pronouns and incorrect use of indefinite/definite articles) and in connectors.

Narrative discourse in these same 15 moderately aphasic patients was investigated in Ulatowska, Freedman-Stern, Doyel, Macaluso-Haynes and North (1983). In addition to the analysis of elements of narrative superstructure, a propositional analysis was made. Again, a reduction of the amount and complexity of language was found; this was accomplished primarily by less embedding and a selective reduction of information. Most of the aphasic subjects had the essential propositions but used fewer optional elements and fewer episodes. Some inaccuracies and errors were noted, primarily in marking reference. More errors in temporal sequencing were

found in the narratives of aphasic individuals. The considerable difficulty the aphasic speakers experienced in giving a moral and summary was felt to be the result of a cognitive problem.

## Geriatric Subjects

North and Ulatowska (1981) explored the discourse abilities of 27 persons over the age of 65 and the correlation of discourse abilities with measures of cognitive abilities and overall competence in living independently. Both procedural and narrative discourses were elicited; the latter was obtained by having the subject retell a pre-recorded story. The discourses were rated on a four-point scale for overall quality. Their correlation data indicated that the number of essential steps given, but not the total number of procedural steps, was related to the quality of the procedural discourse. The major elements of a narrative grammar were all present. The quality of both discourses correlated significantly with competence in living independently, and the quality of procedural discourse significantly correlated with the cognitive test scores.

## Patients with Dementia

Perhaps the discourse abilities of patients with dementia resemble those of head trauma patients more closely than any other clinical population. The discourse of patients with dementia has been described by Albert, Goodglass, Helm, Rubens, and Alexander (1981) as exhibiting (a) incoherence due

to breakdown in logical associations of spoken language, (b) a reduction of the lexical stock as indicated by a naming deficit, (c) simplification in terms of syntax, (d) perseveration, (e) echolalia, (f) use of improbable or unlikely phrases, and (g) tangentiality. Nonlinguistic factors such as impaired memory, reduced rate of information processing, poor attentional skills, and perseveration are felt by these authors to heavily influence the language abilities of patients with senile dementia.

Appell, Kertesz, and Fisman (1982) administered the Western Aphasia Battery (Kertesz, 1982) to 25 patients with Alzheimer's disease. Although all language modalities were impaired to some extent, naming was the most impaired function of all. Of the naming subtests, the most affected was verbal fluency. Following sequential commands was the most difficult comprehension task. The authors described these demented patients as having fluent but irrelevant speech with well-preserved syntax and phonology. They felt there was "a lack of initiative" but that once speech was begun, it tended to be verbose, circuitous, and lacking in coherence.

Although these descriptions of the discourse abilities of the patient with dementia exist, few researchers have subjected this aspect of language to analysis. However, Shekim (1983) investigated the content and cohesion of the discourse of nine patients with Alzheimer's disease. Narrative, expository, and procedural discourse were elicited. The patients with Alzheimer's disease were found to differ

significantly from the age-related controls in that they (a) used fewer cohesive ties per communication unit, (b) had more performance deviations per second, (c) used shorter communication units, (d) used a slower rate of speech, (e) had a greater proportion of maze words, and (f) produced fewer correct propositions per second. In addition, the severity of the dementia was found to be negatively correlated to the rate of speech and the duration of dementia positively correlated to the proportion of maze words.

## Statement of the Problem

A review of the literature on closed head injury indicates that a study of the discourse abilities of this population (a) has not yet been conducted and (b) is needed. There are several reasons to suspect that discourse production problems are present. Descriptions of the spontaneous speech of CHI patients suggest that discourse aberrations exist (Groher, 1977; Halpern, Darley, and Brown, 1973; Hagen, 1981; Heilman et al., 1971; Thomsen, 1975). In addition, oral expressive language deficits such as impaired verbal fluency and naming and cognitive deficits, such as attention, memory, and abtract reasoning problems, are common sequelae of CHI; these factors are known to influence discourse production (de Beaugrande, 1980). Finally, Holland (1980) suggests that the aspects of language most impaired following CHI are the pragmatic and semantic aspects, not the syntactic and

phonological aspects. Since a discourse is a semantic unit whose social use is governed by pragmatic rules, an investigation of language production would be most appropriate at this level.

An analysis of the discourse of CHI patients would be beneficial to speech-language pathologists from several perspectives. It would allow greater specificity in characterizing the aberrant features of discourse which have previously only been described in general terms. It could provide an additional evaluation measure, guide therapeutic intervention, and provide a measure of recovery and/or the effectiveness of treatment. By examining oral language abilities, memory skills, and discourse performance, greater understanding of the interaction of cognitive, linguistic, and neurological factors in discourse production would be gained.

Whether CHI patients produce coherent and cohesive discourse and whether they differ substantially from normal speakers is not known. However, a review of the linguistic literature reveals that there are techniques for analyzing these aspects of discourse production. The studies that have applied these procedures to other clinical populations have found significant differences between their experimental subjects and normal speakers.

When determining the nature of the present investigation, several decisions were made, based on the literature review. An initial decision concerned the discourse type, or genre, to be investigated. Both narrative discourse and procedural

discourse have definite events or steps which must be conveyed to the listener and both require that these events unfold in a logical sequence. Because CHI patients often have organizational and retention problems, difficulties in discourse were expected to be more apparent in these two types of discourse. In addition, narrative and procedural discourse occur frequently in everyday communication situations; understanding the ability of CHI patients to produce these types of discourse would have practical applications to their interpersonal interactions and therapeutic needs. Two types of discourse were included because narrative and procedural discourses differ in terms of their internal organization and linguistic demands and therefore might be differentially affected by a CHI.

An additional concern was the degree of control over the subjects' performance in the experimental tasks. Although it was necessary to devise a method to elicit the targeted discourse genres, CHI patients often function fairly normally when structure is provided but experience difficulty when time and events are unstructured. The tasks were designed to generate specific types of discourse yet varying in terms of the structure provided externally. Because memory skill is a factor in discourse performance, particularly for CHI patients, the memory load had to be restricted and a measure of memory span included as an independent variable.

Because the spontaneous speech of CHI patients has been described as tangential, confused, and excessive, with

problems more in the semantic realm of language, it was decided that the discourse measures should focus on these aspects. Several factors of coherence were selected to be investigated as no one measure could be sufficient for such a global concept. Studies of the discourse abilities of aphasic patients alerted us to the various aspects of cohesion and coherence which might be affected, and the work with schizophrenic patients and patients with Alzheimer's disease indicated that cohesion may be a significant variable.

Lastly, the subject selection criteria had to be established. CHI patients are a heterogeneous group; no two individuals are alike, no two injuries are exactly alike, and no two persons adjust and compensate for deficits in the same manner. The criteria for including subjects had to be as specific as possible, yet yield a group of subjects typical of this population. Previous studies have either been too narrow in their subject selection criteria, i.e., examined only those CHI patients diagnosed as having "aphasia" (Heilman et al., 1971; Levin et al., 1981; Groher, 1977; Thomsen, 1975), or have been too broad, i.e., included elderly subjects or persons with known alcohol abuse (Heilman et al., 1971). A control group of normal-speaking subjects, matched with the experimental subjects, was deemed necessary.

## Statement of the Purpose

This study was designed to characterize the ability of patients following a CHI to produce narrative and procedural

discourse, to determine whether they differ significantly from normal speakers in their ability to produce coherent and cohesive discourse, and to examine the relationships between discourse production ability, oral language skill, and memory span following CHI.

Specifically, the following questions were asked:

1. To what extent do the CHI subjects have impaired comprehension and expression of spoken language?
   a. Do CHI have significant deficits in the comprehension and production of spoken language?
   b. Are certain areas of language more affected than others?
2. To what extent do the CHI subjects have decreased auditory verbal memory abilities?
   a. Do CHI patients differ from normal subjects in their auditory verbal memory abilities?
   b. Do CHI patients vary in their performance on the different tests of memory?
3. In discourse do CHI patients differ in their productivity, both in the amount produced and in the rate of production, from normal speakers?
   a. Do CHI patients produce the same amount of overall discourse as normal speakers in terms of duration of speaking, number of words produced, and number of utterances produced?
   b. Do CHI differ in the length of their utterances from normal speakers?

c. Do CHI patients speak at the same rate of speech as do normal speakers?

d. Does the discourse of CHI patients contain more disfluencies, or mazes, as compared to the discourse of normal speakers?

4. Does the content of the discourse of CHI patients differ from that of normal speakers?

a. Do CHI patients give as much accurate semantic content in their discourse as compared to normal speakers?

b. Do CHI patients produce discourses which contain inaccurate information as judged by the content of discourses produced by normal speakers?

c. Does the discourse of CHI patients contain more instances of problems in clarity of reference as compared to the discourse of normal speakers?

5. Do CHI subjects differ from normal speakers in the use of cohesive ties?

a. Do CHI patients differ from normal speakers in the number of cohesive ties used per utterance in their discourse?

b. Do CHI patients differ from normal speakers in the types of cohesive ties used in their discourse?

6. Are there any differences in the discourse production across the three tasks?

a. Do CHI subjects vary in their discourse performance across the three tasks?

b. If so, on which discourse measures does their performance vary?

c. Do normal speakers vary in their discourse performance across the three tasks?

d. If so, which discourse measures reflect differences across tasks for this group?

7. How well do the language abilities of CHI patients correlate to their discourse performance?

8. How well do the memory abilites of CHI patients correlate to their discourse performance?

# CHAPTER II
# METHODS AND PROCEDURES

## Subjects

### Experimental Subjects

The experimental subjects were native speakers of English who had sustained a closed head injury, defined as a non-penetrating blow to the head which results in a profound loss of consciousness. Patients with depressed skull fractures or evacuated hematomas were included as long as the cerebral surface had not been lacerated and there was no loss of cerebral mass.

Criteria for selection. Several a priori criteria were established for subject selection. A primary criterion was that a closed head injury (CHI) subject had to be past the period of post-traumatic amnesia, i.e., fully conscious, oriented and laying down anterograde memory. The judgment was made either by the subject's physician or by the experimenter through the administration of the Glascow Coma Scale (Teasdale and Jennett, 1974). The major factor in making this judgment was whether the patient was oriented to person, place, and time.

The age of the subjects was limited to a range between 15 and 55 years. The lower cutoff was imposed since the

literature indicates that language lateralization is incomplete until puberty (Lenneberg, 1967), and the upper age limit was established to eliminate the confounding effect of age-related degenerative processes.

None of the experimental subjects had a history of vascular disease, previous head injury, or alcohol/drug abuse. All reported normal premorbid intellectual, sensory, and language skills. Handedness was not a selection criterion because the neurological damage following CHI is diffuse in nature.

Since sufficient verbal expressive skills to perform a discourse task were a requirement for the study, only individuals who generated at least three independent clauses when asked to describe the Cookie Theft picture (shown in Appendix A) from the Boston Diagnostic Aphasia Examination (Goodglass and Kaplan, 1972) were included.

Recruitment of subjects. Eleven experimental subjects, who satisfied the above criteria, were recruited from a variety of sources: Six were from the Department of Speech Pathology at Memorial Rehabilitation Center in Jacksonville, Florida; one from the Speech Pathology Department at Orlando Regional Hospital in Orlando, Florida; one from the Physical Therapy Department of Munroe Regional Hospital in Ocala, Florida; one from the Speech Pathology Service of Alachua General Hospital in Gainesville, Florida; and two from the files of neurosurgeons in private practice in Gainesville, Florida.

Description of subjects. The subjects consisted of four females and seven males between the ages of 17 and 40 (mean age 26.7). All but one were right handed. Years of education ranged from 11 to 16 years with a mean of 13.4 and a median of 13 years of education. Nine subjects were Caucasian and two were Black.

Determination of socioeconomic status (SES) was based on a scale developed in the work of Blau and Duncan (1967). In their view, occupational position is the best single measure of SES since it is the major determinant of economic resources, prestige status, and interests. This scale is based on a ranking of occupations from Duncan's (1961) Socioeconomic Index for All Occupations. The five major categories are higher white-collar, lower white-collar, higher manual, lower manual, and farmers (see Appendix B). Subjects were placed in one of these categories based on their own occupations or, if a student, the occupations of their parents. Table 1 lists the various demographic characteristics for each subject.

Medical information. Medical records for each subject were examined to verify that the reported neurological damage in each instance was indeed caused by a closed head injury. All of the subjects received their injuries in vehicular accidents: One was a pedestrian who was hit by a car, two were drivers of a motorcycle, and the remaining eight were involved in automobile accidents. The length of coma varied from five days to three months (mean of 32 days, standard

Table 1
Demographic Characteristics of Experimental Subjects

| Subject | Handed-ness | Age | Gender | Socioeconomic Scale | Years of Education |
|---|---|---|---|---|---|
| 1 | R | 21 | M | Low White-collar | 13 |
| 2 | R | 26 | F | Low White-collar | 12 |
| 3 | R | 40 | M | High White-collar | 13 |
| 4 | L | 17 | M | Low White-collar | 11 |
| 5 | R | 36 | F | High White-collar | 14 |
| 6 | R | 19 | M | Low Manual | 12 |
| 7 | R | 18 | M | High Manual | 12 |
| 8 | R | 35 | M | High Manual | 15 |
| 9 | R | 28 | M | High White-collar | 16 |
| 10 | R | 25 | F | Low White-collar | 15 |
| 11 | R | 29 | F | Low Manual | 12 |

deviation of 28.61). At the time of the testing, the length of time since injury ranged from one month to 20 months (mean of 234.6 days, standard deviation of 194.4). Other medical information is summarized in Table 2. Most important is that eight of the eleven subjects had at least some degree of dysarthria.

Control Subjects

The control subjects were 21 normal adults who were monolingual speakers of English. A considerably larger number of control individuals were tested in order to increase the probability of obtaining a reliable description of "normal" performance on the discourse tasks. These individuals were recruited through friends of the experimenter and were secretaries, neighbors, relatives, or co-workers of these friends.

The control subjects were matched as a group with the experimental subjects as closely as possible in terms of age, education, gender, and socioeconomic status. Demographic information for the control subjects is found in Table 3. A comparison of the demographic features of the two groups, as displayed in Table 4, indicates that the two groups are similar in terms of their age (mean of 26.7 for experimental subjects and 26.1 for control subjects) and years of education (mean of 13.4 for experimental subjects and 13.2 for control subjects). The control group is slightly more weighted with females as compared to the experimental group; the female:male

Table 2
Medical Information for Closed Head Trauma Subjects

| Subject | Length of Coma[a] | Time Since Onset[b] | Physical Deficits | Visual Deficits |
|---|---|---|---|---|
| 1 | 75 | 296 | Left hemiplegia | None |
| 2 | 30 | 295 | Nonambulatory | None |
| 3 | 30 | 86 | Left hemiparesis | Left hemi-spatial neglect |
| 4 | 60 | 201 | Left hemiparesis | None |
| 5 | 16 | 552 | Left hemiparesis | L homonymous para-central scotomas |
| 6 | 7 | 31 | Right hemiparesis | Slight acuity deficit |
| 7 | 21 | 103 | Left hemiparesis | Mild blurring of vision |
| 8 | 90 | 209 | Left hemiparesis | None |
| 9 | 9 | 137 | Right hemiparesis | Mild double vision |
| 10 | 14 | 616 | Left hemiparesis | None |
| 11 | 5 | 55 | Left hemiparesis | Slight double vision |

[a]In days
[b]Number of days from injury to date of testing

Table 2--extended

| Presence of Dysarthria | Results of CT Scan | Etiology |
|---|---|---|
| Moderate dysarthria | Scattered areas of hemorrhage; Hemorrhage in right basal ganglion, frontal horn, and 3rd ventricle | Automobile accident |
| Mild dysarthria | Subarachnoid hematoma; Faint increased density in posterior right hemisphere | Automobile accident |
| Mild dysarthria | No hematoma; Edema in right parietal; Compression of right lateral ventricle; Shift to left | Automobile accident |
| Mild dysarthria | Left ventricular & intracerebral hemorrhage | Automobile accident |
| None | Left temporal and right parietal hematomas | Automobile accident |
| None | Large left intracerebral hematoma in basal ganglion & temporal lobe | Motorcycle accident |
| Minimal dysarthria | Edema within right hemisphere | Automobile accident |
| Unilateral vocal cord paralysis | Unknown | Motorcycle accident |
| Minimal dysarthria | Left intraventricular hemorrhage | Automobile accident |
| None | Subdural hematoma | Pedestrian hit by car |
| Mild dysarthria | Intraventricular bleeding; Decreased tissue attenuation in Left temporal & frontal region | Automobile accident |

Table 3
Demographic Characteristics of Control Subjects

| Subject | Handed-ness | Age | Gender | Socioeconomic Scale | Years of Education |
|---|---|---|---|---|---|
| 1 | R | 16 | F | High Manual | 10 |
| 2 | R | 18 | M | High Manual | 12 |
| 3 | R | 33 | F | Low White-collar | 14 |
| 4 | R | 17 | M | Low White-collar | 12 |
| 5 | R | 17 | M | High White-collar | 12 |
| 6 | R | 16 | M | High White-collar | 11 |
| 7 | L | 19 | F | High White-collar | 13.5 |
| 8 | R | 20 | F | High Manual | 13.5 |
| 9 | R | 21 | F | High White-collar | 15 |
| 10 | R | 21 | M | High White-collar | 16 |
| 11 | R | 24 | M | Low Manual | 12 |
| 12 | R | 24 | F | Low White-collar | 13.5 |
| 13 | R | 25 | F | Low White-collar | 12 |
| 14 | R | 28 | M | Low White-collar | 15 |
| 15 | R | 24 | F | Low White-collar | 14 |
| 16 | R | 24 | F | Low White-collar | 14 |
| 17 | R | 31 | F | Low White-collar | 13 |
| 18 | R | 55 | M | High Manual | 12 |
| 19 | R | 37 | M | Low White-collar | 14 |
| 20 | R | 53 | M | High Manual | 14 |
| 21 | R | 26 | M | High White-collar | 15 |

Table 4
Comparison of the Demographic
Characteristics of the Two Subject Groups

| | Experimental Group | Control Group |
|---|---|---|
| Age | | |
| Mean | 26.70 | 26.10 |
| Standard Deviation | 7.77 | 10.83 |
| Range | 17 - 40 | 16 - 55 |
| Education (in years) | | |
| Mean | 13.4 | 13.2 |
| Standard Deviation | 1.69 | 1.53 |
| Range | 11 - 16 | 10 - 16 |
| Female:Male Ratio | 4:7 | 10:11 |
| Distribution of Subjects Within SES Scale | | |
| High White-collar | 3 | 6 |
| Low White-collar | 4 | 9 |
| High Manual | 2 | 5 |
| Low Manual | 2 | 1 |

ratio is 4:7 in the experimental group and 10:11 in the control group. Neither group contained individuals who were farmers or farm workers, the fifth category in the socioeconomic scale. However, all of the other four categories are represented in both groups. More subjects fell into the low white-collar category than any other for both subject groups.

## Testing

### Discourse Tasks

The discourse tasks were designed to elicit two narrative discourses and one procedural discourse from each subject. The order in which the three tasks were presented to the subjects was randomized. The three tasks are described as follows:

Task 1: Comic strip story. The subjects were asked to tell a story, or a narrative, based on a series of six black and white line drawings depicting a sequence of events. The comic strip, an adaptation of a Kossatz (1972) comic strip (as depicted in Huber and Gleber, 1982), was drawn on a sheet of white letter-size paper. A reduced copy of the cartoon is shown in Appendix C. The six pictures show a man who was walking down the street with his dog when a flower pot fell from a balcony onto his head. He becomes angry and enters the apartment building to complain. He knocks on a door and out comes a nice elderly lady with a bone for his dog. The man is stunned and kisses the lady's hand in thanks.

Task 2: The Roger story. The subjects retold a story that was presented to them auditorily. The story, 42 seconds long, had been recorded on tape by a male so that each subject would hear the same version of the story and would not assume that the experimenter had previous knowledge of the story. The 104-word narrative was adapted from a text, approximately on an eighth grade reading level, from McCall and Crabbs' (1979) Standard Test Lessons in Reading, Book E. The story has two male characters, Roger and a beggar, thus creating a potential for pronominal ambiguity. The version presented to the subjects is given in Appendix D.

Task 3: How to buy groceries. Subjects were asked to explain to the experimenter how to buy groceries in an American supermarket. The aim of this task was to elicit a procedural discourse in which the speaker must give the steps for accomplishing a certain goal.

The three tasks vary in the amount of external structure imposed on the language performance and in the cognitive factors which influence the discourse production. Stationary visual cues are provided by the comic strip and lend structure to the verbal output. The speaker must convert this visual stimulus into spoken words. In addition to these linguistic considerations, visual perception and logical sequencing ability highly influence the performance since the characters and objects depicted in the comic strip must be perceived and related in a meaningful way.

In Task 2 subjects must decode an auditory verbal stimulus and then give an oral verbal response. Because there are no stationary visual cues for performance, memory is a crucial factor. No structure is provided for Task 3 in the immediate setting but must be created by the speakers as they visualize their own motor patterns or experiences and break them into definite steps in order to explain to the listener how to accomplish this procedure.

## Tests to Evaluate Oral Language Functioning

In order to obtain an objective measure of each CHI subject's verbal skills, the auditory comprehension and verbal expression portions (Subtests I - IV) of the Western Aphasia Battery (Kertesz, 1982) were administered and the Aphasia Quotient obtained. This particular aphasia battery was selected for a number of reasons: (a) It contains a scale for measuring fluency and information content at the discourse level, (b) it is relatively easy and quick to administer regardless of the setting, (c) it includes measures of word association fluency and naming, and (d) it provides an objective numerical score of oral language functioning. The subtests which were administered and their components are listed in Table 5.

## Tests to Evaluate Auditory Verbal Memory

The Logical Memory and Digit Span (Digits Forward + Digits Backward) subtests of the Wechsler Memory Scale (WMS) (Wechsler, 1945) were administered to each CHI subject as

Table 5
Subtests I - IV of the
Western Aphasia Battery (Kertesz, 1982) and their Components

I. Spontaneous Speech

   A. Information Content

   B. Fluency, Grammatical Competence, and Paraphasias

II. Auditory Verbal Comprehension

   A. Yes/No Questions

   B. Auditory Word Recognition

   C. Sequential Commands

III. Repetition

IV. Naming

   A. Object Naming

   B. Word Fluency

   C. Sentence Completion

   D. Responsive Speech

measures of auditory verbal memory span. These subtests were also given to each of the 21 control subjects in order to establish local and age appropriate norms. On the Logical Memory subtest, subjects listened to a story and then attempted to recall as many details on the story as possible. This was repeated for a second story, and the final score was an average of the number of target information units recalled for the two stories. Subjects repeated a series of digits given to them orally, in the same order in which they were presented, for the Digits Forward portion of the Digit Span subtest. The score was the maximum number of digits in a series repeated in this manner. For the Digits Backward portion, the subject repeated a series of numbers in the reverse order from which it was given, and again the score was the maximum number of digits in a series which could repeated.

## Procedures

### Experimental Procedures

All subjects were tested individually by the experimenter. In each instance except one, the testing was conducted in a single session. The time required for testing was approximately one hour for each experimental subject compared to approximately 30 minutes for each control subject. Six experimental subjects were tested in a conference room of a rehabilitation center and four were tested in their homes.

Most control subjects were tested in their homes, but a few were seen at their places of work.

The entire sessions were tape recorded using a Panasonic cassette recorder with a unidirectional microphone held by the subject or the experimenter.

The following procedure was used:

1. An initial period of casual conversation occurred between the experimenter and the subject to put the subject at ease and to develop rapport.

2. The purpose of the study and the general procedures were discussed, and the informed consent form was read to them. The form was signed by the subject, or if under 18, by his parent or guardian.

3. Background information was obtained from all subjects, and orientation to time, person, and place was examined with the CHI subjects. This information was recorded on the Subject Information Sheet (Appendix E).

4. The "Cookie Theft" picture (Appendix A) from the Boston Diagnostic Aphasia Examination (Goodglass and Kaplan, 1972) was shown to the experimental subjects for a screening of their verbal output. If at least three independent clauses were produced, the testing continued. If not, the subject would have been thanked for his participation and the testing would have terminated. However, all potential subjects passed this criterion.

5. The three discourse tasks were presented in a predetermined randomized order to all CHI and control

subjects. Appendix F contains the specific procedures and instructions for the elicitation of the discourses.

6. During a subject's discourse, the experimenter acknowledged his/her remarks with the expression of "mm" and nodding of the head so as to approximate a natural speaker-listener interaction.

7. The experimental subjects were administered Subtests I-IV of the Western Aphasia Battery.

8. All subjects received the two subtests of the Wechsler Memory Scale.

## Transcription Procedures

Each of the three discourses generated by each subject was transcribed by the experimenter. A word-by-word transcription in standard English orthography of all verbal responses to the experimental tasks was performed. Instances of fillers, sound and word repetitions, and revisions were included because of the relevance of these behaviors to the study. Whenever the speaker's intonation contour or pausing indicated the end of a complete thought, a slant line (/) was placed in the transcript. Other symbols used in the transcription process are listed in Appendix G.

Reliability of the transcriptions. After the experimenter had transcribed the tapes, the reliability of those transcriptions was examined. A second speech pathologist was trained in the transcription procedure for approximately one hour, using discourses from three control

subjects. This individual independently transcribed ten percent of the data, or three discourses from the experimental subjects and six discourses from the control subjects. The reliability discourses were selected randomly from all three tasks. Word-by-word comparisons between the two transcriptions were made. Overall agreement between the two transcribers was determined by the formula suggested by Sackett (1978) and given in Conti-Ramsden and Friel-Patti (1983) as follows:

$$\text{Percentage agreement} = \frac{(\text{agreements})}{(\text{agreements} + \text{disagreements})} \times 100.$$

The average word-by-word agreement between the two transcribers was 93 percent for the experimental subjects and 96 percent for the control subjects. Points of disagreement occurred primarily on fillers (<u>uh</u>), functors (<u>and</u>, <u>of</u>, <u>the</u>), and repetition of words. When the fillers and sound or word repetitions were omitted, the average agreement between the two transcribers rose to 97 percent for the experimental subjects and stayed the same (96 percent) for the control subjects. Background noise, imprecise articulation of the subjects, and the limited quality of the recordings were factors which appeared to contribute to instances of disagreement. All disagreements were subsequently resolved by the two transcribers reviewing the recording together.

## Segmentation Procedures

A major problem in the analysis of spoken discourse is the segmentation of the flow of speech into sentences or

utterances. In his studies of the development of oral language in school-aged children Loban (1976) employed the concepts of "communication units" and "mazes" as the basis for segmenting the transcripts. This strategy, adopted in several previous investigations of disordered discourse (Ulatowska et al., 1981; Golper et al., 1980; Shekim, 1983), was utilized in the current study.

The communication unit. A communication unit, or C-unit, is defined by Loban (1976) as an independent predication, or clause, with all of its modifiers. Segmentation by this definition therefore relies heavily on the linguistic structure of the utterances. However, whenever the speaker signaled the termination of an utterance through his/her intonation contour and/or pauses, a slant line (/) was placed in the transcription.

On Task 3, the procedural discourse, several experimental and control subjects produced a series of utterances in the imperative sentence form, each having an understood you as the subject. This was probably the result of the instructions for the task: The subject was asked to tell the experimenter what she should do to buy groceries. The implied you then actually refers to the experimenter. Segmentation in these cases relied more heavily on the speaker's intonation contour and pauses.

In the typed transcriptions, double slant lines (//) were placed at the end of each C-unit. Segmentation procedures were as follows:

1. Divide between independent clauses (e.g., a lady came to the door// she gave the dog a bone//).
2. Divide between any two independent clauses when they are joined with a coordinating conjunction (<u>and</u>, <u>but</u>, <u>or</u>), by an abverbial form indicating general sequence (<u>then</u>, <u>so</u>), or by some reservation (<u>only</u>, <u>or else</u>, <u>except</u>). These forms, called introducers, are counted as part of the second C-unit (e.g., the old man was walking down the street// and a flower pot fell on his head//).
   Note: This means that a compound sentence becomes two separate C-units. However, a unit with compound predicates is counted as one unit (e.g., the beggar approached him and asked him for some money//). If <u>so</u> is used to mean "in order that," treat it as part of a dependent clause, but if <u>so</u> is better paraphrased by "therefore," consider it to begin the next C-unit.
3. Divide direct quotations so that the first clause of the quotation is counted as a continuation of the introducing clause. (e.g., and so the beggar said "I can't give you two quarters// but I'll be glad to sell you two quarters"//). Single word responses at the beginning of a quote go with the portion of the quotation which it precedes (e.g., the beggar replied "No, I won't give you two quarters"//)

<u>Mazes</u>. Loban defines mazes as "a series of words (or initial parts of words), or unattached fragments which do not constitute a communication unit and are not necessary to the

communication unit" (1976, p. 10). Other researchers have termed these as hesitation phenomena or garbles (Hunt, 1965). Mazes represent false starts, revisions, filled pauses, and hesitation in putting thoughts into words, behaviors which are typical of oral expressive language.

All verbalizations within a discourse were counted as either a part of a maze or a communication unit. Mazes were indicated on the transcriptions by enclosing them in brackets ([]). Once a maze is removed from an utterance, the remainder should be a clearly understood unit of thought (e.g., the beggar [uh] came up [and] and asked him for some [ch]-change, some money//).

However, it was occasionally difficult to determine whether a phrase should be considered part of a C-unit or a maze. For example, appositives were counted as part of the longer construction if different words were used for the same concept (e.g., you get a cart, some kind of steel cart on wheels//). However, if the same words or almost the same words were used twice, as would be true in revisions, the material was considered a maze (e.g., Roger [just remembered] suddenly remembered that he needed change for the bus//). When a word or phrase was repeated or revised, the first version went in the maze. Generally, as little as possible should go in the maze, according to Loban (1976), as long as what remains in the C-unit is interpretable English. If the words add to the meaning, they are considered part of the C-unit. However, if they replace other words, then they are

counted as part of a maze. If a communication unit is repeated after intervening words, it is counted as a C-unit rather than a maze.

Words and phrases that introduced a discourse, such as "Let me see...," _well_, and _okay_, were considered to be mazes. The same was true for spoken self-cues ("What else can I say") and for the parenthetical expressions _you know_ and _I guess_ when used as hesitation phenomena.

_Reliability of the segmentation_. After the experimenter had segmented the transcripts, the reliability of the segmentation procedures was examined. A second speech pathologist, the same individual who assisted in determining the reliability of the transcriptions, was trained in distinguishing the communication units and mazes. Instruction in the operational definitions and practice in segmenting six discourses with the experimenter present lasted for approximately 30 minutes. For each subject group, one discourse from each task, or three discourses from control subjects and three from experimental subjects, were selected for training purposes.

The trained individual then independently segmented 25 percent of the discourses. Included were 8 discourses from CHI subjects and 16 discourses from control subjects, with equal distribution among the three tasks. Agreement was determined by the same formula used in the transcription procedures (Sackett, 1978). Comparisons between the two independently segmented transcripts were made regarding the

end of communication units and the presence of mazes (both beginning and end points had to be the same in the two versions to count as an agreement). Reliability between the two judges on the discourses of the experimental subjects ranged from 83 percent to 100 percent, with a mean of 96 percent. On the discourses of the control subjects, the reliability ranged from 89 percent to 100 percent, with a mean of 96 percent. Instances of disagreement were almost always on maze material.

## Discourse Measures

Three types of measures were obtained from the transcripts of the discourse of the experimental and control subjects: productivity, content, and cohesion. Maze material and general statements to indicate termination of the discourse, such as "That's all" and "That's what happened," were excluded from consideration in the measures of content and cohesion.

### Productivity Measures

Total time. Each subject's total speaking time on each discourse was measured in seconds. Fractions of a second were rounded off to the nearest second. Instances where the testing session was interrupted were not included in the total time.

Number of words produced. The number of words which remained after the maze material was excised, and therefore in

communication units, was obtained as a measure of meaningful (nonmaze) output. Contractions, such as can't and she's, were counted as two words. Combinations of words found in informal speech, such as andya, gonna, and sorta, were counted as two words. Parts of real words, common in informal speech, such as 'em for them and 'n for and, were counted as one word. A compound word was counted as one word if it is customarily written that way. On the other hand, hyphenated words, such as check-out, counted as two words.

Number of communication units. The number of communication units in each discourse was counted after the transcripts had been segmented. This measure was an additional measure of the amount of meaningful output.

Rate. The number of syllables produced per second was calculated as a measure of the rate of speech. The total number of syllabic utterances in both C-units and in mazes was tallied for each discourse and divided by the number of seconds. Each instance of a part of a word or a filler, such as um or uh, was counted as one syllable. Word repetitions were also included in the count. For example, the utterance "The el-elderly lady uh gave the the dog a bone" would be tallied as containing fourteen syllables.

Length of communication units. For each discourse, the total number of words (words within C-units) was divided by the number of C-units to determine the average length of the communication units.

Percentage of total syllabic output in mazes. This is similar to a measure employed by Loban (1976) and considered to be an indication of verbal fluency or planning. The percentage of speech output contained in mazes was obtained by the following formula:

$$\text{Percent in mazes} = \frac{\text{number of syllables in mazes}}{\text{total number of syllables produced}} \times 100.$$

Content Measures

Number of accurate content units. Using the approach of Kintsch and van Dijk (1978), an analysis of the propositions in the discourses of the control subjects was conducted. In this approach, the meaning, or content, of a discourse can be represented by a list of propositions. Propositions are composed of concepts. Each proposition must include a predicate, or a relational concept generally realized as a verb, adjective, or adverb, and one or more arguments. Arguments may serve different semantic functions, such as agent, object, and goal.

A proposition was deemed important to the content of a discourse task if at least 80 percent of the control subjects (17 out of 21) included it in their discourses on that task. Propositions which were similar in meaning were grouped together. For example, some control subjects said "Roger was waiting for a bus" and others said "Roger was at a bus stop." These were therefore grouped together. The propositions for each task, obtained in this manner, are listed in Appendix H.

This list was then used to tally the number of these propositions produced in a discourse, for both experimental and control subjects. On each of the three tasks, over half the control subjects produced all the content units for that task: Twelve control subjects used all 10 propositions in Task 1, 12 used the 12 propositions in Task 2, and 11 produced all seven propositions in Task 3.

This measure was included as an indication of how well a subject is able to maintain the topic of a discourse and move the content forward. If insufficient content is transmitted, the links between events are weakened, thus interfering with the coherence of the discourse. The listener must draw greater inferences to connect the events in a meaningful manner. This measure also indicates problems in the interpretation of the stimulus materials (i.e., the comic strip) or the task given (i.e., how to buy groceries) or problems in memory (i.e., recalling the story in Task 2).

Number of inaccurate content units. The discourses were examined also for any inaccurate statements, or propositions. An example is found in the sentence "Roger gave the beggar fifty cents" from Task 2, retelling the Roger story. Although this statement would be marked as having one accurate content unit, "Roger gave the beggar money," it would also be tallied as containing one inaccurate content unit. In the story, Roger gave the beggar all of his change, not fifty cents. Only remarks which were related to the discourse task but

which contained specific and erroneous information, judged by the target content of the control subjects, were tallied in this category. Propositions which were not used by 80 percent of the control subjects but which still represented accurate information were not considered under this category.

For example, in Task 1 subjects often included specific and accurate information such as "The dog is drooling and its tongue is hanging out." However, because this statement was not found in of the discourses of at least 80 percent of the control subjects, it was not counted under accurate content units. Neither would it be counted as an inaccurate content unit as it is a valid interpretation of the stimulus.

Problems in clarity of reference. In order for the content of a discourse to be adequately conveyed, reference to objects, events, and agents must be clear. Five types of instances where reference breaks down were tallied in this study, and the five counts were summed for each discourse. These five types of problems in clarity are:

1. Vague clauses--These are statements which are somewhat true and related to the task but do not convey specific information necessary for the listener to understand events. Statements which are not qualified in any manner and which have vague relevancy to the task are counted in this category. An example from Task 3, explaining how to buy groceries, would be "And you pretty much know what to do with the money" which was the only reference to paying for your groceries. This C-unit would be tallied under this category because its

content is vague yet related to the task and does not contain specific erroneous information.

2. Indefinite words--Instances of indefinite nouns, such as thing and stuff, or indefinite pronouns something and someone, that do not have referents or modifiers are counted in this category. The sentence "Something fell on his head" contains one instance of an indefinite noun. However, the word things in the sentence "Get different things to eat" would not be counted due to the modifier "to eat."

3. Exophoric (deictic) reference--Included here are instances of the words this, that, here, and there when they refer to objects or events in the extratext situation. "And here the man is yelling" contains an example because the listener must refer to the environment (i.e., the comic strip) to locate the referent of here. Use of such terms has been interpreted as a measure of indefiniteness in a person's speech (Berko-Gleason et al., 1980).

4. Errors in use of pronouns--These are instances of nonindexed or ambiguous pronouns and errors in choice of pronoun. A pronoun was considered nonindexed or ambiguous if the referent was not within the text or if the referent could not be clearly identified from the text. In the procedural discourse, subjects occasionally said, "Take your groceries to the check-out/ and she will ring them up." The pronoun she has no referent in the text and would be tallied in this category. The Roger story (Task 2) contained two male characters, Roger and a beggar. Though the referent for most

pronouns could be determined by the meaning of the sentence, in some instances the referent was ambiguous. Any errors in choice of pronoun (e.g., she for he) were also tallied here.

5. Paraphasic errors--These are naming errors. Uncorrected (nonmaze) neologisms, phonemic paraphasias, or semantic paraphasias were tallied in this category. If the remainder of a statement was accurate then the proposition was counted as having an accurate content unit but, additionally, as containing one or more paraphasic error. For example, "After you get all your groceries, you just go to the line-up" would not only be tallied as one correct content unit but also as one paraphasic error, line-up for check-out line.

## Cohesion Measures

As previously stated, cohesive ties link the meaning of sentences, thus creating connectivity. Although the same semantic relationships exhibited by cohesive ties may occur within a sentence, they do not necessarily contribute to the cohesion of the discourse and can be explained by structural rules for sentences. For example, in the sentence "John thought he lost his keys," the personal pronoun he is an instance of the Pronominalization rule, a sentence structural rule. However, there are no such structural relations between sentences; there are no grammatical restrictions on the sequence in which the sentences occur in a discourse. The sentences are related by their content and by cohesive

elements. Therefore, only ties between C-units, not within C-units, were tallied.

Utilizing Halliday and Hasan's (1976) strategy and categories, the experimenter coded each discourse for cohesive ties. Examples of the five types of cohesion are given in Appendix I and are explained below. The coding sheet for the content and cohesion measures is shown in Appendix J.

Reference. All languages contain items which have the property of "reference" in that "instead of being interpreted semantically in their own right, they make reference to something else for their interpretation" (1976, p. 31). Such items found in English are called personals, demonstratives, and comparatives by Halliday and Hasan.

To understand this category it is helpful to examine the general notion of reference. Reference can be divided into the two major categories of exophora and endophora. Exophora occurs when reference is made to something in the situation outside the text. Endophora occurs when reference is made to something within the text itself. This latter category can be divided into anaphora, where reference is made to something that has already appeared in the text, and cataphora, where reference is made to something coming ahead in the text. Our interest here is primarily in anaphoric reference. Exophoric items are not cohesive ties, and cataphoric references are cohesive only in special cases.

Halliday and Hasan include three types of Reference: personal, demonstrative, and comparative. Within personal

reference, generally only the third person forms of pronouns (he, she, it, and they) are found as cohesive elements. The speaker (I) and listener (you) roles are interpreted by reference to the situation and are therefore exophoric. In direct quotations, however, I and you are anaphoric and therefore cohesive devices. We may be anaphoric in certain settings. The utterances "The lady came to the door/ and she gave the dog a bone/" contain one instance of referential cohesion because she can only be interpreted by referring back to the lady.

Demonstrative reference is a form of verbal pointing. Although some of the words listed here (this, that, these, those, here, and there) may also have deictic, or exophoric, functions, only the anaphoric usage is considered cohesive. An example of this type of referential cohesion is found in the statements "A flower pot fell on the man's head/ and that made him angry/." Not all definite noun phrases are instances of anaphoric reference. In this study a the was tallied only when the noun following it was previously introduced with a, some, or a possessive determiner. Therefore, if a subject states "The lady gave the dog a bone" with no previous mention of a dog, then the is not counted as a cohesive tie. However, if the subject had previously stated "The man is walking with his dog," the in the above sentence would have been tallied under demonstrative reference.

Certain adjectives and adverbs are considered to be items of comparative reference. Cohesion occurs because a likeness

or comparability between two things is presented. An example is found in "Roger gave the beggar all his money// but the beggar was <u>not quite as nice</u>."

For each type of referential cohesion, the presupposed item may be in the immediately preceding sentence or in a more distant sentence. However, the referent must be obtainable from the text for the cohesive tie to be counted.

<u>Substitution</u>. Substitution is the replacement of one item by another. The substituted item has the same structural function as that of the item it replaces. For example, a nominal may be substituted for a nominal and a verbal for a verbal. These cohesive links are always endophoric and generally are anaphoric. The three types of substitution are nominal, verbal, and clausal. The substituted item serves as a place holder to mark the point where presupposition is involved. Nominal substitution differs from personal or demonstrative reference in that the substituted nominal group is not identical with that of the nominal group it presupposes. There is always some redefinition, as opposed to Reference where there is total referential identity between the reference item and the item it presupposes. The statements "Just see what the other people are doing/ and you do the <u>same/</u>" contain an example of nominal substitution.

<u>Ellipsis</u>. Ellipsis is the fourth type of cohesive tie. An elliptical item is one which leaves a specific structural slot to be filled from elsewhere in the text. It can be regarded as an instance of Substitution with nothing rather

than with a counter. The three types of Ellipsis are nominal, verbal, and clausal. What is omitted in the first is part of a noun phrase; in the second, a portion of the verb phrase; and in the third, part of the clause. "The man and the dog went into the building/ both were angry/" contains an example of nominal ellipsis.

Conjunction. Conjunction is the fourth category of cohesive relations. It differs from the previous three in that it is not an anaphoric relation. Conjunctive elements are cohesive because of their specific meanings; they express meanings which presuppose the presence of other components in the discourse. They specify the way in which the linguistic element following it is connected to what has gone before. The simplest from of conjunction is and. When it is used for coordination (men and women), it is not a cohesive element. It acts as a cohesive tie when it indicates a relation between sentences, to indicate the unfolding of events over time, as in the passage "A man was walking down the street/ and a flower pot fell on his head." This is called an additive conjunctive tie. Other additive elements are furthermore, nor, incidentally, and or.

Adversative conjunctive ties indicate the relationship between the two sentences is 'contrary to expectation.' Characteristic adversative conjunctions are yet, but, however, instead, and though. Causal conjunctive ties express a result, reason, or a purpose and include so, thus, hence,

therefore, and because of that. An initial and can be used with these.

Temporal conjunctions express the temporal relationship between two adjacent sentences. When the relation is that one is subsequent in time to the other, conjunctions such as then, next, afterwards, after that, and subsequently are employed. Generally the second sentence refers to the later event. Temporal ties also include words like at the same time and just then, which indicate simultaneous time. Conjunctions like earlier, before that, and previously indicate that the external temporal relation is opposite the sequence of the sentences. Temporal conjunctions can also express relations that are temporal in the sense that there is an enumeration of points in a sequence (first, next, second, and finally), or they can express the time dimension present in the communication process (finally, in conclusion, and in short).

The last category of conjunctive ties consists of what are called continuatives. Halliday and Hasan state that these are words that encompass "some subtle and complex relations within the communication process" (1976, p. 268). They include words like now, well, of course, and surely which, when nonprominent in intonation and accent, serve a backward-linking function.

Lexical cohesion. Lexical cohesion is "the cohesive effect achieved by the selection of vocabulary" (1976, p. 274). It is a natural consequence of having a consistent topic. The closeness of the relationship of the lexical items

helps to establish cohesion. Generally, this type of link occurs through "reiteration," or repetition of various forms of a lexical item. A word may be repeated, a general word may replace the lexical item, a synonym may be used, a near-synonym may replace the lexical item, or a superordinate (general class name) may appear. In all instances, one lexical item refers back to another. However, it is not necessary for the two words to have the same referent. An example of this is "Why does this little boy wiggle so? Other boys don't wiggle."

Halliday and Hasan included a second type of lexical cohesion, collocation, but this category was not tallied in the present study due to difficulties in its operational definition. Previous cohesive analyses of disordered discourse (Rochester, Martin, and Thurston, 1977; Shekim, 1983) have also excluded this type for similar reasons.

## Reliability of the Content and Cohesion Measures

The reliability of the content and cohesion measures was established by having two coders independently review 10 percent of the total discourses, or three discourses (one for each task) from the experimental subjects and six (two for each task) from the control subjects. The experimenter, one of the coders, trained another speech pathologist in the rationale for these measures and in their operational definitions. Additionally, six discourses were scored together during a three hour training session. Due to the

complexity of the measures, only one content or cohesion tally could be conducted on each reading of the discourse. The coding form used in this procedure is found in Appendix J. Agreement between the two raters was calculated by the previously described formula given in Conti-Ramsden and Friel-Patti (1983).

Overall agreement was 89.5 percent with the experimental subjects' discourses and 90.9 percent with the control subjects' discourses. Agreement by the category of measure was 93.2 percent for the content measures, 90.5 for referential cohesion, 60 percent for the combined categories of substitution and ellipsis cohesive ties, 95.3 percent for conjunctive cohesion, and 75.8 percent for lexical cohesion. There were but five instances of either substitution and ellipsis in the discourses rated, and the second rater missed two at the end of her lengthy coding session. In both subject groups, the procedural discourse produced the lowest reliability scores (82.5 percent for the control subjects and 83.3 percent for the experimental subjects). Reliability for the comic strip discourse was 94.4 percent for the control subjects and 89.3 percent for the experimental subjects, whereas for the Roger story it was 91.4 percent and 100 percent, respectively.

# CHAPTER III
# RESULTS

The data analyses for this study were conducted through the Center for Instructional and Research Computing Activities using SPSS-X (Statistical Program for the Social Sciences) for the analyses of variance and SAS (Statistical Analysis System) for the correlational analyses. All determinations of significance were conducted at the .05 level. The raw data are listed separately for language and memory functioning and, for the discourse variables, by the category of discourse measure (productivity, content, and cohesion) for the two groups in Appendix K.

## Language Functioning

The Western Aphasia Battery (WAB) was designed by Kertesz (1982) to examine the principal clinical aspects of spoken language functioning: content, fluency, auditory comprehension, repetition and naming. The information content and fluency of spontaneous speech, based on responses to six questions concerning the patient's background and to a picture description task, are scored on ten-point rating scales. Auditory comprehension is determined in Subtest II by performance on the three components, answering yes/no questions, understanding single words, and following

sequential commands. On Subtest III, Repetition, subjects are asked first to repeat words, then phrases and short sentences, and finally complex sentences. Subtest IV evaluates naming abilities in several ways: naming objects, word fluency, completing sentences, and answering questions with single word responses.

To score the WAB, the raw scores for the aspects of auditory comprehension and naming are summed. Then the raw scores for Subtests II - IV are adjusted so that the maximum possible score is 10 for each subtest. Next, the adjusted scores are added to the ratings of content and fluency. Finally, this sum is multiplied by two to calculate the Aphasia Quotient (AQ). The AQ has been determined to be a reliable measure of the degree of impairment in oral language (Kertesz, 1982) and is viewed as "a percent of normal because the test is easy enough for normals that they regularly achieve AQs of 100" (1982, p. 6). In his research, Kertesz (1979) used the cut-off AQ of 93.8 with impaired naming and fluency as his definition of aphasia. This figure was derived from the mean AQ of brain damaged but nonaphasic individuals (as judged from clinical impressions).

The raw scores for CHI subjects on Subtests I - IV are found in Appendix K-1, and Table 6 displays the means and standard deviations (SD) of the raw scores. The adjusted scores on each of the five aspects of oral language examined in the WAB and the obtained Aphasia Quotient for individual CHI subjects are shown in Table 7. The Aphasia Quotients

Table 6
Means and Standard Deviations (SD) of Raw Scores of Experimental Subjects on Subtests of the Western Aphasia Battery (Kertesz, 1982)

| Subtests [a] | Mean | SD |
|---|---|---|
| I. Spontaneous Speech | | |
| Information Content (10) | 8.82 | 1.72 |
| Fluency (10) | 8.36 | 1.21 |
| II. Auditory Comprehension | | |
| Yes/No Questions (60) | 58.91 | 2.43 |
| Word Recognition (60) | 58.18 | 2.99 |
| Sequential Commands (80) | 73.27 | 13.30 |
| III. Repetition (100) | 96.73 | 3.64 |
| IV. Naming | | |
| Object Naming (60) | 54.91 | 9.42 |
| Word Fluency (20) | 11.36 | 3.75 |
| Sentence Completion (10) | 9.40 | 1.35 |
| Responsive Speech (10) | 9.27 | 1.01 |

[a] Maximum possible raw score in parenthesis

Adjusted Language Scores and Aphasia Quotients for the
Experimental Subjects on the Western Aphasia Battery (Kertesz, 1982)

| Subject | Spontaneous Speech Content | Spontaneous Speech Fluency | Auditory Comprehension | Repetition | Naming | Aphasia Quotient |
|---|---|---|---|---|---|---|
| 1 | 7 | 6 | 10.0 | 9.6 | 8.8 | 82.8 |
| 2 | 10 | 9 | 10.0 | 9.6 | 8.8 | 94.8 |
| 3 | 6 | 8 | 7.0 | 9.2 | 5.1 | 70.6 |
| 4 | 6 | 6 | 9.1 | 9.0 | 7.9 | 76.0 |
| 5 | 10 | 9 | 10.0 | 10.0 | 9.4 | 96.8 |
| 6 | 8 | 9 | 9.5 | 9.9 | 8.1 | 89.0 |
| 7 | 10 | 9 | 9.9 | 10.0 | 9.4 | 96.6 |
| 8 | 10 | 9 | 9.9 | 10.0 | 9.5 | 96.8 |
| 9 | 10 | 9 | 10.0 | 9.3 | 8.7 | 94.0 |
| 10 | 10 | 9 | 9.9 | 10.0 | 9.2 | 96.2 |
| 11 | 10 | 9 | 9.3 | 9.8 | 8.6 | 93.4 |
| Maximum | 10 | 10 | 10.0 | 10.0 | 10.0 | 100.0 |
| Mean | 8.82 | 8.36 | 9.51 | 9.67 | 8.5 | 89.73 |
| SD | 1.72 | 1.21 | 0.89 | 0.36 | 1.24 | 9.22 |

ranged from 70.6 to 96.8; no CHI subject obtained an Aphasia Quotient of 100. The average AQ was 89.73 but there was large variability (SD = 9.22). Five CHI individuals met Kertesz's criteria for classification as exhibiting aphasia. Employing Kertesz's (1982) taxonomic table, these subjects would be classified, based on the pattern of their subtest scores, as having anomic aphasia. Of the six subjects who obtained AQs above the 93.8 cut-off, three exhibited very minimal overall oral language deficits (AQs above 96).

Table 7 indicates that the five aspects of oral language were not equally affected. The means of the adjusted scores for these five areas ranged from 8.36 (SD = 1.21) for fluency of spontaneous speech to 9.67 (SD = 0.36) for repetition. Auditory comprehension for oral verbal language and repetition were the least depressed areas of language functioning (means of 9.51 and 9.67, respectively). In fact, as depicted in Table 6, near perfect performance occurred on comprehension of spoken words (mean of 58.18 out of a possible 60 points) and yes/no questions (mean of 58.91 out of 60). However, several subjects had problems when confronted with the multiple commands and complex syntax in the Sequential Commands subtest (mean of 73.27 out of a possible 80 points, SD = 13.3).

The majority of the CHI patients (7 out of 11) received perfect scores for the information content of their spontaneous speech, as shown in Table 7. A score of ten on this scale indicates that on relatively simple discourse tasks the CHI subjects were able to produce "normal" information

content, i.e., give correct responses to six social questions (What is your name?, How are you today?, etc.) and produce more than 10 concepts in complete sentences to describe a picture.

Table 7 indicates that the aspects of oral language most impaired in the CHI subjects were naming (mean = 8.5, SD = 1.24) and fluency of spontaneous speech (mean = 8.36, SD = 1.21). Examination of Table 6 reveals that few problems in naming were experienced on the more automatic tasks of sentence completion and answering simple questions. Greater difficulty occurred on confrontation naming of objects (mean of 54.91 out of a possible 60 points). However, there was considerable variability of performance on this task (SD = 9.42). The most difficult naming task for all subjects was the word fluency task (mean of 11.36 out of possible 20, SD = 3.75). Word fluency on the WAB is determined by counting the number of animals a subject can name in one minute. Kertesz reports that this measure is "very sensitive to any brain damage" (1982, p. 5).

Hesitations and word-finding difficulty prevented any of the subjects from obtaining a rating of 10 on the fluency scale, as depicted in Table 7. Two subjects produced such limited output that each received the rating of six. A rating of eight for fluency was given to one subject who had fluent but circumlocutory speech with marked word-finding difficulty and occasional paraphasias.

In summary, it appears that all the CHI subjects in this study had at least some degree of language impairment. Examination of each individual's pattern of scores, as listed in Table 7, indicates that this impairment varied from mild problems in only the areas of naming and fluency to moderate deficits in all aspects except repetition. Review of the group means in Table 7 reveals that the least affected area of language functioning in these CHI subjects was repetition, closely followed by auditory comprehension. The most disturbed language areas were naming, particularly word fluency, and fluency of spontaneous speech.

## Auditory Verbal Memory Abilities

The raw scores on the three tests of auditory verbal memory abilities from the Wechsler Memory Scale (Wechsler, 1945) are given in Appendix K-2 and K-3. The statistical analysis of these measures was conducted with the multivariate analyses of variance and subsequent univariate analyses of variance for the discourse measures due to the repeated measures design of this study. The results of the univariate analyses of variance for differences between groups, as displayed in Table 8, indicate that the CHI subjects scored significantly lower than the control subjects on each of the three subtests.

The scores on the Logical Memory subtest varied from 0.5 to 11.5 for the experimental subjects and from 5 to 16 for the control subjects. A score on this subtest represents the

Table 8
The Means and Standard Deviations (SD) of Scores on Three Subtests of the Wechsler Memory Scale (Wechsler, 1945) for Closed Head Injured (CHI) Subjects and Control Subjects with F values from a Repeated Measures Univariate Analysis of Variance and Associated Probabilities (p) for Differences Between the Two Groups

| | CHI Subjects | | Control Subjects | | | |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | F (df = 1, 30) | p |
| Logical Memory | 6.41 | 4.21 | 11.12 | 3.08 | 13.095 | .001 |
| Digits Forward | 5.64 | 1.29 | 6.62 | 1.20 | 4.596 | .04 |
| Digits Backward | 3.36 | 1.96 | 5.10 | 1.26 | 9.23 | .005 |
| Total | 15.05 | 6.85 | 21.79 | 6.25 | | |

average number of units of information recalled for each of the two stories read aloud to the subjects. As Table 8 indicates, the mean number of information units recalled was 6.41 (SD = 4.21) for the CHI subjects, about 60 percent of the mean number of information units recalled by the control subjects, 11.12 (SD = 3.08). An analysis of variance indicated that this is a highly significant difference, F = 13.10 (df = 1, 30; p = .001).

The scores on the Digits Forward and Digits Backward subtests were not summed in order to examine how the performance of the CHI subjects varied on the two tests. The CHI individuals repeated an average of 5.64 digits forward (range = 4 to 8, SD = 1.29). Although their performance on Digits Forward was significantly reduced when compared with the control subjects (F = 4.60; df = 1, 30; p = .04), the magnitude of difference was less than with the other two memory tests. The normal subjects repeated an average of 6.62 digits in normal order (range = 4 to 8, SD = 1.2).

Table 8 reveals that on Digits Backward the CHI subjects were only able to produce an average of 3.36 digits (SD = 1.96) in the reverse order from which they were given, whereas the control subjects were able to produce 5.1 digits (SD = 1.26). An F value of 9.23 (df = 1, 30; p = .005) indicated that the CHI subjects were significantly depressed in their ability to repeat digits in the reverse order. The range of scores on Digits Backward was 0 to 6 for the experimental subjects and 3 to 7 for the control subjects.

Additional analyses of variances examined the performance of each group over the three tests of memory, and the results are displayed in Table 9. The CHI subjects demonstrated approximately the same scores on Logical Memory and Digits Forward ($F = .39$; $df = 1, 10$; $p > .05$) but scored significantly lower on Digits Backward than on either Logical Memory ($F = 9.56$; $df = 1, 10$; $p = .01$) or Digits Forward ($F = 10.89$; $df = 1, 10$; $p = .008$).

On the other hand, the control subjects exhibited highly significant differences between each of their three subtest scores (see Table 9). They scored significantly higher on Logical Memory than on Digits Forward ($F = 50.33$; $df = 1, 20$; $p < .001$) or on Digits Backward ($F = 80.53$; $df = 1, 20$; $p < .001$). Significantly more digits were produced on Digits Forward than on Digits Backward ($F = 45.92$; $df = 1, 20$; $p < .001$).

In summary, the results indicated that the CHI subjects were significantly depressed on all three tests of auditory verbal memory as compared to the normal subjects. However, they performed closer to normal subjects on repeating digits forward, both in terms of the mean score and in the variability of performance, than on the other two memory tests. The CHI scores were most depressed on the Logical Memory subtest, with CHI subjects recalling only 60 percent of the information recalled by normal subjects, and this decrement was accompanied by greater variability in the CHI scores. Although the normal subjects were able to almost

Table 9
Results of Univariate Analyses of Variance for Differences Between Subtests of Wechsler Memory Scale (Wechsler, 1945) for Both Subject Groups

| | Closed Head Injured Subjects | Control Subjects |
|---|---|---|
| Logical Memory vs. Digits Forward | $F = 0.38$<br>$df = 1, 10$<br>$p > .05$ | $F = 50.33$<br>$df = 1, 20$<br>$p < .001$* |
| Logical Memory vs. Digits Backward | $F = 9.56$<br>$df = 1, 10$<br>$p = .01$* | $F = 80.53$<br>$df = 1, 20$<br>$p < .001$* |
| Digits Forward vs. Digits Backward | $F = 10.89$<br>$df = 1, 10$<br>$p = .008$* | $F = 45.92$<br>$df = 1, 20$<br>$p < .001$* |

*Significant at the preestablished criterion level of .05.

double their memory span when the information was received in narrative form (compare 11.12 on Logical Memory with 6.62 on Digits Forward for control subjects), the CHI subjects did not experience a similar significant increase (compare 6.41 on Logical Memory with 5.64 on Digits Forward).

## Results on Discourse Measures

### Preliminary Analyses

Because the design of this study required repeated measures on the same subjects, a series of repeated measures multivariate analyses of variance (MANOVA) was determined to be the appropriate approach to the statistical analysis. This procedure, however, requires the assumption of equal variances for the two subject groups. This posed several problems. Many of the measures in this study are actually frequency counts for various independent categories (i.e., the categories of cohesion and the content measures). No assumption can be made about the underlying distribution from which these measures were obtained. A count in a particular category may follow a binomial, multinomial, geometric, or normal distribution. In addition, the number of subjects is small, particularly in comparison to the number of variables being analyzed.

Nevertheless, preliminary multivariate tests for homogeneity of variance were conducted. Not surprisingly, both the F(max) test and Bartlett's Test of Sphericity indicated a highly significant difference between the

variances of the experimental and control groups. However, Zar (1974) states that Bartlett's test is overly sensitive to nonnormality, and "it is seldom worthwhile to use it in conjunction with analyses of variances" (1974, p. 135). Both Zar and Winer (1962) report that F tests are robust enough to perform well even with marked heterogeneity of variances. In cases where the size of the subject groups are unequal and variances are vastly different, the probability of a Type I error increases, "to a degree dependent upon the magnitude of the heterogeneity" (Zar, 1974, p. 135). This means that in the present instance, an analysis of variance may produce results which suggest less significance than what may actually exist. The decision was made to proceed with multivariate analyses of variance because (a) these procedures have much greater strength and descriptive abilities than nonparametric statistical procedures, (b) these procedures take into consideration the repeated measures, thereby protecting against Type II errors, and (c) the type of error which would be likely by following these procedures is a Type I error, i.e., the level of significance may appear less than the level that actually exists.

Several preliminary multivariate F tests incorporating all the data were conducted first to determine the main effects in this study, i.e., group effect versus task effect versus group by task interaction. As indicated in Table 10, a multivariate F test examining the comic stip narrative for group effect found a significant difference between the two

Table 9
Multivariate Analyses of Variance: Preliminary Overall Analyses and Analyses for Group Differences on Individual Tasks with their Associated Probabilities (p)

| | Pillais F ratio | Degrees of Freedom | p |
|---|---|---|---|
| Omnibus Analyses | | | |
| Group Effect on Task 1 | 2.55 | 1, 6, 7.5 | .035 |
| Group X Task Interaction | 2.20 | 2, 5.5, 22.5 | .002 |
| Task Effect | 9.26 | 2, 5.5, 22.5 | < .001 |
| Analyses for Group Effects on Each Task | | | |
| Task 1 | 2.76 | 1, 6, 7.5 | .025 |
| Task 2 | 3.45 | 1, 6, 7.5 | .009 |
| Task 3 | 3.21 | 1, 6.5, 7 | .013 . |

groups on this task ($F = 2.55$; df = 1, 6, 7.5; $p = .035$). Additional omnibus MANOVAs found a significant group by task interaction ($F = 2.63$; df = 2, 5.5, 22.5; $p < .001$) and a significant task effect ($F = 16.02$; df = 2, 5.5, 22.5; $p < .001$). These results meant that although the two groups varied significantly on at least one of the tasks and the performances of both groups varied significantly across the three tasks, there was significant interaction between the groups and the tasks. Therefore, the data could not be collapsed across all three tasks, and it was necessary to analyze each task separately for group effects and each group separately for the task effects.

## Differences Between Groups on Discourse Measures

Table 10 displays the F ratios obtained from three multivariate analyses of variance for group effect conducted on the data from each discourse task. The results indicated that there were significant differences between the closed head trauma subjects and the normal speakers on each of the tasks. The obtained F for Task 1 was 2.76 (df = 1, 6, 7.5; $p = .025$), for Task 2 the F was 3.45 (df = 1, 6, 7.5; $p = .009$), and the F value for Task 3 was 3.21 (df = 1, 6.5, 7; $p = .013$). To determine those discourse measures on which differences between the two groups were significant, additional univariate F-tests were conducted. The results for each task are as follows.

Task 1: Comic strip narrative

Productivity. Table 11 displays the means, standard deviations, F ratios, and levels of significance for each of the discourse measures on Task 1. Although CHI subjects did not significantly differ from normal subjects in the average amount of time they spoke (the mean for the CHI subjects was 36.64 seconds as compared to a mean of 39.24 for the control subjects) or in the number of communication units (C-units) they produced (CHI produced a mean of 8.09 C-units and the normal subjects produced a mean of 9.10 C-units), the experimental subjects did use significantly fewer total nonmaze words in their discourses ($F = 6.68$; $df = 1, 30$; $p = .015$). The CHI mean number of words was 72.0 compared to 107.38 for control subjects.

This can partially be accounted for by the fact that the CHI subjects, on the average, spoke at a significantly ($F = 14.75$; $df = 1, 30$; $p = .001$) slower rate of speech (mean rate of 2.53 syllables per second, $SD = 0.94$) than did normal speakers (mean rate of 3.94 syllables per second, $SD = 0.54$). In addition, significantly more of their utterances fell into mazes (mean 9.79 percent of syllables in mazes, $SD = 10.29$) as compared to the normal speakers (mean 3.95 percent of syllables in mazes, $SD = 4.06$) [$F(1, 30) = 5.32$, $p = .03$]. Significantly shorter C-units were found in the discourses of CHI subjects (mean = 8.91, $SD = 2.38$) than in those of normal speakers (mean = 12.67, $SD = 4.01$), as indicated by an obtained F value of 8.10 ($df = 1, 30$; $p = .008$).

Table 11
Means, Standard Deviations (SD), and F Values (df = 1, 30) with Associated Probabilities (p) for Differences Between Groups on the Discourse Measures for Task 1, the Comic Strip Narrative

| Discourse Measure | Closed Head Trauma Subjects | | Normal Subjects | |
|---|---|---|---|---|
| | Mean | SD | Mean | SD |
| | Productivity | | | |
| Time (in sec) | 36.64 | 13.35 | 39.24 | 17.49 |
| Words | 72.00 | 31.57 | 107.38 | 39.12 |
| C-units | 8.09 | 2.63 | 9.10 | 3.75 |
| Words per C-unit | 8.91 | 2.38 | 12.67 | 4.01 |
| Syllables per sec | 2.53 | 0.94 | 3.55 | 0.56 |
| % Syllables in Mazes | 9.79 | 10.29 | 3.95 | 4.06 |
| | Content | | | |
| Accurate Content Units | 4.73 | 3.52 | 9.05 | 1.47 |
| Inaccurate Content Units | 1.91 | 2.21 | 0.00 | 0.00 |
| Problems in Clarity | 2.27 | 2.37 | 0.38 | 0.50 |
| | Cohesive Ties per C-unit | | | |
| Reference | 1.14 | 0.47 | 1.53 | 0.39 |
| Substitution | .00 | .00 | 0.01 | 0.03 |
| Ellipsis | .00 | .00 | .00 | .00 |
| Conjunction | 0.66 | 0.27 | 0.72 | 0.17 |
| Lexical | 0.61 | 0.46 | 0.91 | 0.39 |
| Total ties | 2.40 | 0.99 | 3.18 | 0.62 |

*Significant at preestablished criterion level of $p < .05$.

Table 11--extended

| F value (df = 1, 30) | Level of Significance |
|---|---|
| 0.19 | .67 |
| 6.68 | .02* |
| 0.62 | .44 |
| 8.10 | .008* |
| 14.75 | .001* |
| 5.32 | .03* |
| | |
| 24.19 | < .001* |
| 16.14 | < .001* |
| 12.68 | .001* |
| | |
| 6.52 | .02* |
| 1.02 | .32 |
| --- | --- |
| 0.72 | .40 |
| 3.96 | .06 |
| 7.40 | .01* |

Content. Significant differences between the groups were demonstrated for all three content measures. Table 11 indicates that the CHI subjects generated an average of 4.73 accurate content units for the comic strip narrative (SD = 3.52) which was approximately half the number of propositions produced by the normal speakers (mean = 9.05, SD = 1.47). The ANOVA for this variable resulted in an F value (df = 1, 30) of 24.19 with $p < .001$. Although the normal speakers used no inaccurate content in their narratives, the experimental group had a mean of 1.91 inaccurate content units (SD = 2.21), obtaining an F value of 16.14 ( df = 1, 30; $p < .001$) . The normal speakers had few problems in their clarity of reference in this task (mean = 0.38, SD = 0.50). Conversely, the CHI subjects exhibited significantly more (F = 12.68; df = 1, 30; $p = .001$) problems in this regard (mean = 2.27, SD = 2.37).

A comparison of the number of C-units with the number of accurate content units indicates that the control subjects produced one accurate content unit for every C-unit (9.05 accurate content units compared to 9.10 C-units), with no inaccuracies and few problems in clarity (mean = .38, SD = .58). On the other hand, although the CHI individuals produced almost as many C-units as the normal speakers (8.09), only about 60 percent of these (4.73) could potentially have contained accurate content units.

Cohesion. The results indicated that CHI subjects used significantly fewer cohesive ties per C-unit in their narratives based on the comic strip than did the normal

speakers. As displayed in Table 11, the obtained $F(1, 30)$ for the total number of cohesive ties per communication unit was 7.40 ($p = .01$). Neither group had any instances of ellipsis as a cohesive tie. Substitution was used only by the normal speakers and then only rarely (mean = 0.01, SD = 0.03). Both groups exhibited approximately the same number of conjunctive ties per C-unit in Task 1 (mean for CHI subjects = 0.66, SD = 0.27, mean for control subjects = 0.72, SD = 0.17; $F = 0.72$; df = 1, 30; $p > .05$). The CHI subjects, however, used significantly fewer instances of reference cohesion [$F(1, 30) = 6.52$, $p = .02$] and showed a tendency to use fewer lexical ties [$F(1, 30) = 3.96$, $p = .056$] than did the control subjects.

Task 2: Retelling the Roger story

Productivity. Examination of Table 12 reveals that although there were no significant differences between the two groups in terms of their speaking times or the number of C-units produced, the CHI subjects again used significantly fewer nonmaze words in their narratives ($F = 4.13$; df = 1, 30; $p = .05$). On the average, the CHI patients produced 82.36 words to retell the Roger story (SD = 39.85), whereas the control subjects produced 104.33 words (SD = 21.70).

As Table 12 shows, differences in performance on the remaining three productivity measures were highly significant: The C-units of the CHI subjects were shorter ($F = 5.34$; df = 1, 30; $p = .03$), the rate of syllables per second was slower ($F = 10.17$; df = 1, 30; $p = .003$), and a greater percent of

Table 12
Means, Standard Deviations (SD), and F Values (df = 1, 30) with Associated Probabilities for Differences Between Two Groups on the Discourse Measures for Task 2, Retelling the Roger Narrative

| Discourse Measure | Closed Head Trauma Subjects | | Normal Subjects | |
|---|---|---|---|---|
| | Mean | SD | Mean | SD |
| Productivity | | | | |
| Time (in sec) | 38.73 | 14.55 | 37.43 | 7.35 |
| Words | 82.36 | 39.85 | 104.33 | 21.70 |
| C-units | 8.00 | 4.10 | 8.24 | 1.87 |
| Words per C-unit | 10.51 | 3.29 | 12.91 | 2.50 |
| Syllables per sec | 2.80 | 0.85 | 3.66 | 0.66 |
| % Syllables in Mazes | 11.62 | 11.81 | 4.75 | 3.32 |
| Content | | | | |
| Accurate Content Units | 7.27 | 4.80 | 11.38 | 0.80 |
| Inaccurate Content Units | 1.27 | 1.62 | 0.10 | 0.30 |
| Problems in Clarity | 2.45 | 5.35 | 0.14 | 0.65 |
| Cohesive Ties per C-unit | | | | |
| Reference | 1.19 | 0.56 | 1.64 | 0.42 |
| Substitution | .00 | .00 | .00 | .00 |
| Ellipsis | 0.02 | 0.05 | .00 | .00 |
| Conjunction | 0.67 | 0.23 | 0.82 | 0.11 |
| Lexical | 1.02 | 0.54 | 1.57 | 0.40 |
| Total ties | 2.90 | 1.10 | 4.04 | 0.69 |

*Significant at preestablished criterion level of $p < .05$.

Table 12--extended

| F value (df = 1, 30) | Level of Significance |
|---|---|
| 0.11 | .74 |
| 4.13 | .05* |
| 0.05 | .82 |
| 5.34 | .03* |
| 10.17 | .003* |
| 6.32 | .02* |
| | |
| 15.03 | .001* |
| 10.73 | .003* |
| 3.92 | .06 |
| | |
| 6.54 | .02* |
| -- | -- |
| 4.13 | .05* |
| 6.53 | .02* |
| 10.89 | .002* |
| 12.90 | .001* |

their syllabic utterances were in mazes ($F = 6.32$; $df = 1, 30$; $p = .02$).

The control group demonstrated dramatically less variability in their performance on the first four productivity measures (Time, Words, C-units, and Words per C-unit) for this task than for the other two tasks. In contrast, the CHI group exhibited the same if not greater variability on this task.

Both groups approximated the temporal length of the original story (42 seconds). The CHI subjects spoke for a mean of 38.73 seconds, and the control subjects spoke for a mean of 37.43 seconds. Yet only the control subjects approximated the original number of words (104). The CHI subjects produced a mean of 82.36 words, and the control subjects produced a mean of 104.44 words.

Content. As in Task 1, the CHI individuals produced significantly fewer accurate content units than did the normal speakers ($F = 15.03$; $df = 1, 30$; $p = .001$). As displayed in Table 12, the CHI subjects generated an average of 7.27 accurate content units ($SD = 4.80$), whereas the control subjects used an average of 11.38 accurate content units ($SD = 0.80$). Occasionally, the control subjects made errors in their recall of the story (mean = 0.10, $SD = 0.30$), but the CHI subjects produced significantly more ($F = 10.73$; $df = 1, 30$; $p = .003$) inaccurate content units (mean = 1.27, $SD = 1.62$). Although the discourses of CHI subjects contained more problems in clarity of reference (mean = 2.45, $SD = 5.35$) than

did the discourses of control subjects (mean = 0.14, SD = 0.65), the great variability of the experimetal individuals resulted in this difference being nonsignificant ($F = 3.92$; df = 1, 30; $p = .057$).

Cohesion. On this task, as in the previous one, CHI speakers produced significantly fewer cohesive ties per C-unit than did normal speakers ($F = 12.90$; df = 1, 30; $p = .001$). The CHI individuals used significantly fewer reference ($F = 6.54$; df = 1, 30; $p = .02$), conjunctive ($F = 6.53$; df = 1, 30; $p = .02$), and lexical ($F = 10.89$; df = 1, 30; $p = .002$) cohesive ties than did the control individuals. Neither group used substitution and only a few instances of ellipsis occurred in the experimental group.

Task 3: How to buy groceries

Productivity. The results on this discourse task, as shown in Table 13, are somewhat dissimilar to the results on the other two tasks. There was a significant difference ($F = 7.28$; df = 1, 30; $p = .01$) between the two groups in the amount of time they talked (mean = 35.91, SD = 21.83 for the experimental group and mean = 59.71, SD = 24.59 for the control group). For this procedural discourse CHI subjects produced significantly fewer C-units ($F = 10.86$; df = 1, 30; $p = .002$), but their C-units were not significantly shorter than those produced by control subjects ($F = 3.58$; df = 1, 30; $p = .07$).

As in the two previous tasks, however, the CHI individuals used significantly fewer words in their discourses

Table 13
Means, Standard Deviations (SD), and F Values (df = 1, 30) with Associated Probabilities for Differences Between Groups on the Discourse Measures for Task 3, the Procedural Discourse

| Discourse Measure | Closed Head Trauma Subjects | | Normal Subjects | |
|---|---|---|---|---|
| | Mean | SD | Mean | SD |
| Productivity | | | | |
| Time (in sec) | 35.91 | 21.83 | 59.71 | 24.59 |
| Words | 77.36 | 39.89 | 167.00 | 64.74 |
| C-units | 7.18 | 2.96 | 12.48 | 4.85 |
| Words per C-unit | 11.03 | 3.45 | 14.06 | 4.66 |
| Syllables per sec | 2.93 | 0.69 | 3.56 | 0.79 |
| % Syllables in Mazes | 10.61 | 9.13 | 5.58 | 2.15 |
| Content | | | | |
| Accurate Content Units | 4.64 | 1.75 | 6.19 | 1.40 |
| Inaccurate Content Units | 0.36 | 0.92 | 0.00 | 0.00 |
| Problems in Clarity | 2.36 | 1.86 | 1.19 | 1.40 |
| Cohesive Ties per C-unit | | | | |
| Reference | 0.27 | 0.21 | 0.44 | 0.26 |
| Substitution | 0.02 | 0.05 | 0.01 | 0.03 |
| Ellipsis | .00 | .00 | 0.01 | 0.05 |
| Conjunction | 0.64 | 0.25 | 0.76 | 0.19 |
| Lexical | 0.59 | 0.45 | 0.98 | 0.56 |
| Total ties | 1.52 | 0.55 | 2.20 | 0.71 |

*Significant at presestablished criterion level of $p < .05$.

Table 13--extended

| F value (df = 1, 30) | Level of Significance |
|---|---|
| 7.28 | .01* |
| 17.45 | < .001* |
| 10.86 | .003* |
| 3.58 | .07 |
| 5.04 | .03* |
| 5.92 | .02* |
| | |
| 7.50 | .01* |
| 3.35 | .08 |
| 4.04 | .05* |
| | |
| 3.35 | .08 |
| 0.90 | .35 |
| 0.90 | .35 |
| 2.55 | .12 |
| 4.06 | .05* |
| 7.84 | .009* |

($F = 17.45$; df = 1, 30; $p < .001$), spoke at a slower rate ($F = 5.04$; df = 1, 30; $p = .03$), and had a greater percentage of their syllabic utterances in mazes ($F = 5.92$; df = 1, 30; $p = .02$).

Content. Once again the results, as revealed in Table 13, indicated that CHI subjects produced significantly fewer accurate content units ($F = 7.50$; df = 1, 30; $p = .01$). However, the CHI individuals produced a greater percent of the established accurate content units for this task (mean of 4.64 content units or 66.3 percent of the seven established units) than they did on the two previous tasks (47.3 percent in Task 1 and 60.6 percent in Task 2).

As noted from Table 13, no inaccurate content units were evidenced by the control group, but a few inaccurate content units were found in the discourses of the experimental speakers (mean = 0.36, SD = 0.92). Although this difference was not significant, it did reflect a trend ($F = 3.35$; df = 1, 30; $p = .077$). The CHI individuals showed significantly greater frequency in problems in clarity on this task ($F = 4.04$; df = 1, 30; $p = .05$). Both groups produced nonindexed pronouns and indefinite words, reflecting an assumption by the speaker of knowledge on the part of the listener.

Cohesion. As in the two previous discourse tasks, the CHI subjects used significantly fewer cohesive ties per C-unit than did the control subjects ($F = 7.84$; df = 1, 30; $p = .009$). However, the frequencies within each category of cohesion were so small that significant differences between

the two groups by category were demonstrated only with lexical cohesion ($F = 4.06$; $df = 1, 30$; $p = .05$). Reference cohesion approached significance ($F = 3.35$; $df = 1, 30$; $p = .08$).

## Differences Between Tasks for Each Group

The following statistical procedures were performed for each group in order to identify any discourse effects attributable to the different tasks. First, a repeated measures multivariate analysis of variance (MANOVA) determined whether significant differences occurred in the performances of the subjects of a group across the tasks. When the F value from this test was significant, as was true for each group, subsequent univariate analyses of variance (ANOVAs) isolated those discourse measures demonstrating significant variability across the three tasks. The next step, employing only those measures found to show significant differences across tasks, was a series of MANOVAs for each pair of tasks, Task 1 with Task 2, Task 1 with Task 3, and Task 2 with Task 3, to determine where the performances differed. For each pair of tasks, if the MANOVA was significant (and it was in every instance), then the subsequent ANOVAs were examined to find which particular measures showed significant differences for that pair. The results of these procedures are presented in this section, first for the experimental subjects and then for the control subjects.

### Closed head injured subjects

An initial multivariate analysis of variance with all discourse measures from the CHI subjects for the three tasks

indicated that there were significant differences across the three tasks ($F = 2.35$, $df = 2, 6, 2$; $p = .05$). A series of univariate analyses of variance then examined the discourse measures to determine which variables accounted for these differences. Table 14 indicates that significant differences in performance across the three discourse tasks occurred for 4 of the 15 discourse measures--syllables per second ($F = 3.41$; $df = 2, 20$; $p = .05$), reference cohesive ties per communication unit ($F = 19.82$; $df = 2, 20$; $p < .001$), lexical cohesive ties per communication unit ($F = 5.66$; $df = 2, 20$; $p = .01$), and total cohesive ties per C-unit ($F = 13.50$; $df = 2, 20$; $p < .001$). Thus, the performance of the CHI subjects failed to vary significantly on the majority of the discourse measures. In other words, significant differences occurred on only one of the productivity measures, syllable per second; on none of the content measures; and on three of the cohesion measures, reference, lexical, and total ties per communication unit.

Additional MANOVAs pooled the data from these three measures for each possible pair of tasks to determine specifically where the differences occurred. Each comparison produced significant differences, as follows: Task 1 to Task 2, $F = 6.04$ ($df = 1, 1, 2.5$; $p = .02$); Task 1 to Task 3, $F = 12.10$ ($df = 1, 1, 2.5$; $p = .003$); and Task 2 to Task 3, $F = 13.15$ ($df = 1, 1, 2.5$; $p = .002$).

The results of the univarate ANOVAs which examined the variables on each possible pair of tasks, as shown in Table 15, indicate that the CHI subjects spoke at a significantly

Table 14
F Values (df = 2, 20) and Associated Probabilities (p) from Univariate Analyses of Variance for Differences in Discourse Measures Between Tasks for the Experimental Group

| Discourse Measure | F (df = 2, 20) | p |
|---|---|---|
| Productivity | | |
| Time | 0.13 | .88 |
| Words | 0.58 | .57 |
| Communication Units | 0.30 | .74 |
| Words per C-unit | 3.10 | .07 |
| Syllable per sec | 3.41 | .05* |
| % Syllables in Mazes | 0.26 | .77 |
| Content | | |
| Accurate Content Units | 3.34 | .06 |
| Inaccurate Content Units | 2.40 | .12 |
| Problems in Clarity | 0.01 | .99 |
| Cohesive Ties per C-unit | | |
| Reference | 19.82 | < .001* |
| Substitution | 2.22 | .13 |
| Ellipsis | 2.10 | .15 |
| Conjunction | 0.11 | .90 |
| Lexical | 5.66 | .01* |
| Total | 13.50 | < .001* |

*Significant at preestablished criterion level of $p < .05$.

Table 15

F Values (df = 1, 10) and Associated Probabilities from Univariate Analyses of Variance for Differences Between Task Pairs on Discourse Measures Found to Vary Significantly by Task for Experimental Subjects

| Discourse Measure | Tasks 1 vs. 2 | | Tasks 1 vs. 3 | | Tasks 2 vs. 3 | |
|---|---|---|---|---|---|---|
| | F | p | F | p | F | p |
| Syllable per sec | 7.32 | .02* | 4.14 | .07 | 0.72 | .42 |
| Reference Cohesion | 0.08 | .78 | 38.59 | <.001* | 30.88 | <.001* |
| Lexical Cohesion | 10.70 | .008* | 0.02 | .89 | 7.37 | .02* |
| Total Cohesion | 2.80 | .13 | 14.57 | .003* | 25.32 | .001* |

*Significant at the preestablished criterion level of $p < .05$.

slower rate (syllables per second) on the comic strip narrative, Task 1, compared to the story about Roger, Task 2 ($F = 7.32$; $df = 1, 10$; $p = .02$). No significant differences on this measure were found in the comparisons between the other task pairs. These results was puzzling at first because the CHI group means for syllables per second on Tasks 1 - 3 were, in order, 2.53, 2.80, and 2.93. The ANOVAs determined that this measure was significantly different for Task 1 and Task 2 but not for Task 1 and Task 3. A closer examination of the data revealed, however, that despite the difference in group means between Task 1 and Task 3, the individual differences in rate of speaking only approached significance ($F = 4.14$; $df = 1, 10$; $p = .07$).

Table 15 also indicates that the use of reference as a cohesive device occurred significantly more often in the two narratives (Tasks 1 and 2) than in the procedural discourse, Task 3 (Task 1 vs. 3, $F = 38.59$; $df = 1, 10$; $p < .001$ and Task 2 vs. 3, $F = 30.88$; $df = 1, 10$; $p < .001$), and there was no significant difference in the frequency of reference cohesion between the two narratives, Task 1 and Task 2 ($F = 0.08$; $df = 1, 10$; $p > .05$). The CHI subjects used significantly more lexical cohesive ties (see Table 16) in retelling the Roger story than in the other two discourses ($F = 10.70$; $df = 1, 10$; $p = .008$ on Task 1 vs. Task 2; $F = 7.37$; $df = 1, 10$; $p = .02$ on Task 2 vs. Task 3). However, there was no significant difference in the number of lexical ties per communication unit used in the comic strip narrative, Task 1, as compared to

Task 3, the procedural discourse ($F = 0.02$; $df = 1, 10$; $p > .05$).

The results also indicate that, like reference cohesive ties, significantly more cohesive ties per C-unit (total of all cohesion categies) were found in each of the two narratives than in the procedural discourse (Task 3). The F value for Task 1 versus Task 2 was 2.80 ($p > .05$), but the F value for Task 1 versus 3 was 14.57 ($p = .003$) and for Task 2 versus 3 was 25.32 ($p = .001$).

In a closer examination of the results of the initial univariate analyses displayed in Table 14, a trend toward significant differences between tasks, as denoted by a probability between .055 and .099, was demonstrated on the measures of words per communication unit ($F = 3.10$; $df = 2, 20$; $p = .067$) and the number of accurate content units ($F = 3.34$; $df = 2, 20$; $p = .056$). That is, slightly shorter communication units were exhibited on the comic strip narrative than on the other two tasks. Comparing Tables 11, 12, and 13, one notes than the average number of words in a communication unit was 8.91 (SD = 2.38) on Task 1 in contrast to 10.51 (SD = 3.29) on Task 2 and 11.03 (SD = 3.45) on Task 3. The CHI subjects produced the greatest number of accurate content units on Task 2, with a mean of 7.27, but the high standard deviation (4.80) discloses that there was considerable variability in their performance on this task. The mean number of accurate content units exhibited in

Task 1, 4.73, and in Task 3, 4.63, was similar, but greater variability occurred on the former.

In summary, these results revealed a rather homogeneous performance on the part of the experimental subjects across all three tasks. The exceptions were primarily in the use of cohesive ties. More instances of reference ties per C-unit were used in each narrative discourse as compared with the procedural discourse. This is not surprising because narratives are about people and their activities, and reference to them in the form of pronouns is likely. More instances of lexical cohesion per communication unit were employed in Task 2 than in either Task 1 or Task 3. This is perhaps a reflection of the limited set of characters and events in this story and the fact that a model for their output (the taped story they heard) facilitated the production of lexical cohesive ties. Nonetheless, previously discussed results from Table 12 pointed out that the CHI subjects manifested significantly fewer lexical cohesive ties per communication units in Task 2 as compared to normal speakers. The CHI speakers did use significantly more cohesive ties per C-unit in their narratives as compared to their procedural discourse. The mean number of total cohesive ties per C-unit was 2.40 for Task 1, 2.90 or Task 2, and 1.52 for Task 3.

The rate of speaking was the only other variable to show significant differences across tasks. The CHI subjects spoke more slowly on the comic strip task than on the other two tasks.

Control subjects

As in the procedure followed for the experimental subjects, a multivariate anaylsis of variance was the initial statistical test for determining whether the performance of the control subjects varied significantly on the discourse measures across the three tasks. The resulting F ratio was 17.76 (df = 2, 4, 14) which was highly significant ($p < .001$). Subsequent univariate ANOVAs isolated those variables on which performance varied significantly. These results, as reported in Table 16, indicated that there were highly significant differences in the performance of the control subjects across the three tasks on 7 of the 11 discourse measures examined. Cohesion could not be broken down into each of the categories due to the high correlations among these measures. Therefore, only Reference Cohesion and Total Cohesion were employed.

Three productivity measures proved to be significant in terms of differences across tasks for the control group. These were the duration of the discourses in seconds ($F = 19.33$; df = 2, 40; $p < .001$), total words ($F = 21.10$; df = 2, 40; $p < .001$), and number of communication units ($F = 15.79$; df = 2, 20; $p < .001$). Additional univariate ANOVAs for each paired combination of tasks specified where these differences appeared, and the results are displayed in Table 17. For each of these three productivity measures, the pattern was the same. There were no significant differences between the two narratives (F values ranged from 1.83 to 0.33 with df = 1, 20 and $p > .05$), but measures from each of the narratives were

Table 16
F Values (df = 2, 40) and Associated Probabilities (p) from Univariate Analyses of Variance for Differences in Discourse Measures Across Tasks for Control Group

| Discourse Measure | F (df = 2, 40) | p |
|---|---|---|
| Productivity | | |
| Time (in sec) | 19.33 | < .001* |
| Words | 21.10 | < .001* |
| Communication Units | 15.79 | < .001* |
| Words per C-unit | 1.28 | .29 |
| Syllables per sec | 0.47 | .63 |
| % Syllables in Mazes | 1.41 | .26 |
| Content | | |
| Accurate Content Units | 93.33 | < .001* |
| Inaccurate Content Units | 2.11 | .14 |
| Problems in Clarity | 6.44 | .004* |
| Cohesive Ties per C-unit | | |
| Reference Cohesion | 70.58 | < .001* |
| Total Cohesive Ties | 52.28 | < .001* |

*Significant at preestablished criterion level of $p < .05$.

Table 17
F Values (df = 1, 20) and Associated Probabilities from Univariate Analyses of Variance for Differences Between Tasks on Discourse Measures Previously Found to Vary Across Tasks for Control Group

| Discourse Measure | Tasks 1 vs. 2 | | Tasks 1 vs. 3 | | Tasks 2 vs. 3 | |
|---|---|---|---|---|---|---|
| | F(1, 20) | p | F(1, 20) | p | F(1, 20) | p |
| | | | Productivity | | | |
| Time (in sec) | 0.33 | .57 | 28.45 | < .001* | 21.64 | < .001* |
| Words | 0.16 | .70 | 25.91 | < .001* | 24.72 | < .001* |
| C-units | 1.83 | .19 | 17.98 | < .001* | 20.62 | < .001* |
| | | | Content | | | |
| Accurate Content Units | 70.00 | < .001* | 36.25 | < .001* | 204.84 | < .001* |
| Problems in Clarity | 1.51 | .23 | 5.83 | .03* | 8.39 | .009* |
| | | | Cohesion | | | |
| Reference | 0.73 | .40 | 118.17 | < .001* | 117.67 | < .001* |
| Total | 23.21 | < .001* | 56.16 | < .001* | 70.13 | < .001* |

*Significant at the preestablished criterion level of $p < .05$.

significantly different from the measures taken from the procedural discourse (F values ranged from 17.98 to 28.45; all with df = 1, 20 and $p < .001$). As can be noted from Table 16, the number of words per communication unit, the rate of speaking, and the percentage of syllables in mazes failed to vary signficantly across the three tasks (F values are 1.28, 0.47, and 1.41, respectively, all with df = 2, 40 and $p > .05$).

Differences across tasks also appeared in the content measures for the control subjects (see Table 16). The number of accurate content units varied significantly ($F = 93.33$; df 2, 40; $p < .001$), and task was found to be a significant factor in the frequency of problems in clarity ($F = 6.44$; df = 2, 40; $p = .004$). Reference to Table 17 shows that significant differences occurred between each pair of tasks in terms of the number of accurate content units. It should be remembered that the total number of possible accurate content units varied from task to task. Ten units were set forth as the "norm" for Task 1, whereas 12 accurate content units were outlined for Task 2 and seven for Task 3. Therefore, the performance of the control subjects is a reflection of the variation which occurred across tasks in the maximum number of accurate content units.

Significantly more instances of the measure Problems in Clarity were exhibited by the control subjects on the procedural discourse than on the two narratives as reflected by an F ratio of 5.83 (df = 1, 20; $p = .03$) for the comparison

of Task 1 to Task 3 and an F ratio of 8.39 ($df = 1, 20$; $p = .009$) for the comparison of Task 2 to Task 3 (see Table 17). No significant difference was found in the frequency of Problems in Clarity between the two narrative discourses ($F = 1.51$; $df = 1, 20$; $p > .05$).

Table 16 reveals that the number of inaccurate content units did not vary significantly across the tasks ($F = 2.11$; $df = 2, 40$; $p > .05$). This is not surprising if one reviews Table 11, 12 and 13 which indicate that the control subjects did not produce any inaccurate content in Tasks 1 and 3 and only a few in the retelling of the Roger story (mean = 0.10 inaccurate content units in Task 2, SD = 0.30).

Finally, Table 16 shows that both reference cohesive ties and total cohesive ties per C-unit were used differently across tasks ($F = 70.58$; $df = 2, 40$; $p < .001$ and $F = 52.28$; $df = 2, 40$; $p < .001$; respectively). It may be seen from Table 17 that the number of reference ties per C-unit did not differ significantly for the two narratives, Task 1 and Task 2 ($F = 0.73$; $df = 1, 20$; $p > .05$), but that significantly fewer reference ties were used on the procedural discourse than on either Task 1 ($F = 118.17$; $df = 1, 20$; $p < .001$) or Task 2 ($F = 117.67$; $df = 1, 20$; $p < .001$).

With the total number of cohesive ties the pattern is different in that significant differences emerged between each pair of tasks. The F value of Task 1 versus Task 2 was 23.21 ($p < .001$), of Task 1 versus Task 3 was 56.16 ($p < .001$), and of Task 2 versus Task 3 was 70.13 ($p < .001$). The least

number of cohesive ties per C-unit was found in the procedural discourse, Task 3 (mean = 2.20). Significantly more instances occurred in Task 1 (mean = 3.18) and even more in Task 2 (mean = 4.04).

In summary, the control subjects manifested variability in their performance across the three tasks on 7 out of the 11 measures examined in this analysis. For all but two of these measures, the differences occurred between the procedural discourse and each of the two narrative discourses, but not between the two narratives. More language was produced by the control subjects for the procedural task compared to the other two tasks; they spoke longer, produced more words, and used longer sentences. In addition, the normal speakers relied less on reference cohesive ties to connect their sentences and exhibited more instances of problems in clarity of reference in their account of how to buy groceries than in their narratives.

Significant differences in the frequency of total cohesive ties per C-unit and in the number of accurate content units occurred across all three tasks. This latter finding is a reflection of the range in the maximum number of accurate propositions established for each task. As a whole, these results suggest that normal speakers are sensitive to the differences between narrative and procedural discourses and alter their discourse performance according to the genre.

## Correlational Analyses

The relations between auditory verbal memory span, oral language abilities, and discourse performance for the closed head injured subjects were examined by calculating Pearson product-moment correlations between the sets of measures. This procedure was conducted through the use of SAS: Statistical Analysis System.

### Correlations Between Oral Language Abilities and Discourse Measures

Pearson product-moment correlation coefficients were calculated between the adjusted scores of the subtests of the Western Aphasia Battery (WAB) (Kertesz, 1982) and the discourse measures for each discourse task separately. The cohesion categories of ellipsis and substitution were eliminated from the correlation matrix due to their low frequencies. However, they were included in the count of total cohesive ties.

Task 1: The comic strip narrative. The correlation coefficients obtained for the comic strip narrative are found in Table 18. The average length of the communication unit (words per C-unit) and the percentage of total syllables in mazes were the two productivity measures which demonstrated significant correlations with the oral language measures. The former obtained a moderate positive correlation coefficient with the fluency scale ($r = .70$, $p < .05$) and Repetition ($r = .63$, $p < .05$). The correlations of the percentage of

Table 18
Pearson Product-Moment Correlation Coefficients Calculated Between the Subtests of the Western Aphasia Battery (Kertesz, 1982) and the Discourse Measures from the Comic Strip Narratives of the Closed Head Injured Subjects

| Discourse Measure | Speech Content | Speech Fluency | Auditory Comprehension | Repetition | Naming |
|---|---|---|---|---|---|
| Productivity | | | | | |
| Time (in sec) | .11 | -.07 | .22 | .07 | .25 |
| Total words | .46 | .44 | .31 | .49 | .36 |
| C-units | .16 | -.01 | .32 | .08 | .32 |
| Words per C-unit | .51 | .70* | .09 | .63* | .16 |
| Syllables per sec | .29 | .54 | -.02 | .35 | .02 |
| % Syllables in Mazes | -.61* | -.08 | -.91*** | -.32 | -.86*** |
| Content | | | | | |
| Accurate Content Units | .45 | .36 | .51 | .26 | .45 |
| Inaccurate Content Units | -.35 | -.17 | -.55 | -.08 | -.50 |
| Problems in Clarity | .01 | .17 | -.46 | -.09 | -.34 |
| Cohesive Ties per C-unit | | | | | |
| Reference | .56 | .43 | .48 | .76** | .56 |
| Conjunction | .58 | .36 | .74** | .66* | .70* |
| Lexical | .58 | .58 | .21 | .63* | .34 |
| Total cohesive ties | .69* | .57 | .52 | .83** | .61* |

*$p < .05$
**$p < .01$
***$p < .001$

syllables in mazes to auditory comprehension ($r = -.91$, $p < .001$), naming ability ($r = -.86$, $p < .001$), and the content of spontaneous speech ($r = -.61$, $p < .05$) indicated a strong inverse relationship existed between the amount of disfluency in the comic strip narrative and the language skills of auditory comprehension, naming, and information content of spontaneous speech.

As Table 18 indicates, none of the coefficients of the content measures in relation to subtests of the WAB reached signficance ($p > .05$). However, the number of accurate content units showed a consistent low positive correlation to all of the language scores ($r = .26$ to $.51$).

A number of significant correlations appeared between the cohesion measures and the WAB oral language scores (see Table 18). The repetition score was highly correlated to reference cohesive ties ($r = .76$, $p < .01$) and to total cohesive ties ($r = .83$, $p < .01$). Smaller but still significant ($p < .05$) coefficients were obtained between repetition and conjunctive ties, $r = .66$, and between repetition and lexical ties, $r = .63$. Conjunctive ties also significantly correlated with auditory comprehension ($r = .74$, $p < .01$) and naming ($r = .70$, $p < .05$). Although a consistent positive relationship was found between the total number of cohesive ties per C-unit and all the language measures, only three reached significance: content, $r = .69$ ($p < .05$); repetition, $r = .83$ ($p < .01$); and naming, $r = .61$ ($p < .05$).

Task 2: Retelling the Roger story. The oral language abilities of the CHI subjects were more highly correlated with their discourse performance on Task 2 than on the other two tasks. Table 19 displays the correlation coefficients for this task. Total speaking time, total words, words per C-unit, accurate content units, lexical ties, and total cohesive ties all showed strong positive correlations with the two scales on the WAB for rating spontaneous speech, information content and verbal fluency. This indicates that these two rating scales are particularly valid indicators of discourse performance when speakers are retelling a story previously heard. Notice, however, that this does not hold when these speakers tell a story based on a series of pictures (Task 1) or tell how to do something (Task 3).

As Table 19 indicates, the total speaking time on this task demonstrated highly positive correlations with the content ($r = .78$, $p < .01$) and fluency measures ($r = .95$, $p < .001$) of spontaneous speech, a significant positive relationship to repetition ($r = .66$, $p < .05$), and a nonsignificant ($p > .05$) but positive relationship to auditory comprehension ($r = .30$) and naming ($r = .36$). The total number of words produced to retell the Roger story was found to be moderately correlated with the content rating scale, $r = .68$ ($p < .05$), and highly related to verbal fluency, $r = .78$ ($p < .01$). A consistent although nonsignificant ($p > .05$) positive correlation existed for Total Words with the remaining three language measures (auditory comprehension,

Table 19
Pearson Product-Moment Correlation Coefficients Calculated Between the Subtests of the Western Aphasia Battery (Kertesz, 1982) and the Discourse Measures on Narratives about Roger for the Closed Head Injured Subjects

| Discourse Measure | Content | Speech Fluency | Auditory Comprehension | Repetition | Naming |
|---|---|---|---|---|---|
| Productivity | | | | | |
| Time (in sec) | .78** | .95*** | .30 | .66* | .36 |
| Total words | .68* | .78** | .36 | .55 | .38 |
| C-units | .38 | .55 | .32 | .44 | .29 |
| Words per C-unit | .61* | .67* | .03 | .36 | .12 |
| Syllables per sec | .31 | .46 | .12 | .33 | .11 |
| % Syllables in Mazes | -.17 | .33 | -.51 | .09 | -.49 |
| Content | | | | | |
| Accurate Content Units | .94*** | .72** | .66* | .68* | .75** |
| Inaccurate Content Units | -.59 | -.16 | -.45 | -.43 | -.62* |
| Problems in Clarity | -.29 | .14 | -.24 | .07 | -.35 |
| Cohesive Ties per C-unit | | | | | |
| Reference | .56 | .35 | .33 | .38 | .44 |
| Conjunction | .35 | .61* | -.14 | .48 | .01 |
| Lexical | .73** | .82** | .02 | .45 | .15 |
| Total cohesive ties | .73** | .72** | .16 | .54 | .31 |

*p < .05
**p < .01
***p < .001

$r = .36$; repetition, $r = .55$; naming, $r = .38$) and for the number of C-units with all the language measures (ranging from .29 to .55).

Reference to Table 19 also reveals that, in general, the number of accurate content units was the discourse measure that correlated most highly with the oral language subtests of the WAB. The coefficients were .66 ($p < .05$) with auditory comprehension, .68 ($p < .05$) with repetition, .72 ($p < .01$) with the fluency rating, .75 ($p < .01$) with naming, and .94 ($p < .001$) with the content rating. The extremely high correlation between the two measures, the number of accurate content units and the content rating scale, affirms that these measures are recording the same aspect of discourse production. Low to moderate negative coefficients were obtained between the number of inaccurate content units and all language scores, with only the correlation with naming reaching significance ($r = -.62$, $p < .05$).

Significant correlations between cohesive ties per C-unit and the language subtest scores were evidenced only on the spontaneous speech measures of Content and Fluency. Conjunctive cohesion and fluency were moderately correlated ($r = .61$, $p = < .05$), whereas both lexical cohesion and total cohesive ties were highly correlated to both content ($r = .73$, $p < .01$ for both cohesion measures) and fluency ($r = .82$, $p < .01$ for lexical cohesion and $r = .72$, $p < .01$ for total cohesion).

Task 3: How to buy groceries. Examination of Table 20 reveals that fewer correlation coefficients between the discourse measures and the subtest scores of the WAB attained significance for this task than for the two narrative discourses. However, a number of trends were found. Moderate positive correlation coefficients (ranging from .40 to .59) were found between the productivity measures of time, words, and C-units and all the language scores. The only coefficient of these measures to reach significance was between total words and the content rating, $r = .66$ ($p < .05$).

The number of accurate content units, as seen in Table 20, was highly related to repetition ability, $r = .85$ ($p < .001$), and moderately related to naming ability, $r = .63$ ($p < .05$). In addition, low to moderate positive correlations (.31 to .58) occurred between accurate content and the remaining three language scores. Although all the coefficients were nonsignificant ($p > .05$), low to moderate (-.15 to -.58) inverse correlations between the number of inaccurate content units and all language scores were exhibited on this procedural task.

For the cohesion measures, only three significant correlation coefficients emerged. The discourse measure of conjunctive ties showed a significantly positive relation to repetition skill ($r = .66$, $p < .05$). However, nonsignificant but consistent positive correlations (.33 to .57) were found between conjunctive ties and the remaining four language scores. The total number of cohesive ties on the procedural

Table 20
Pearson Product-Moment Correlation Coefficients Calculated Between the Subtests of Western Aphasia Battery (Kertesz, 1982) and the Discourse Measures on the Procedural Discourses of the Closed Head Injured Subjects

| Discourse Measure | Content | Speech Fluency | Auditory Comprehension | Repetition | Naming |
|---|---|---|---|---|---|
| Productivity | | | | | |
| Time (in sec) | .56 | .50 | .44 | .42 | .40 |
| Total words | .66* | .59 | .54 | .56 | .54 |
| C-units | .54 | .51 | .54 | .43 | .49 |
| Words per C-unit | .27 | .35 | -.07 | .30 | < -.01 |
| Syllables per sec | -.09 | .08 | -.18 | -.09 | -.16 |
| % Syllables in Mazes | -.33 | .15 | -.60* | -.20 | -.62* |
| Content | | | | | |
| Accurate Content Units | .47 | .31 | .58 | .85*** | .63* |
| Inaccurate Content Units | -.58 | -.58 | -.15 | -.53 | -.19 |
| Problems in Clarity | .15 | .38 | -.07 | -.04 | -.14 |
| Cohesive Ties per C-unit | | | | | |
| Reference | .15 | .06 | .35 | .45 | .42 |
| Conjunction | .52 | .57 | .33 | .66* | .33 |
| Lexical | .23 | .43 | -.11 | .43 | -.02 |
| Total cohesive ties | .51 | .66* | .20 | .86*** | .30 |

*p < .05
**p < .01
***p < .001

discourse task was highly correlated with repetition ability ($r = .86$, $p < .001$), moderately correlated with fluency ($r = .66$, $p < .05$), and modestly (.20 to .51) correlated with the other three language measures.

Correlations Between Memory Abilities and Discourse Measures

Task 1: The comic strip narrative. Table 21 displays the correlation coefficients calculated between the three tests of auditory verbal memory span from the Wechsler Memory Scale (Wechsler, 1945) and the discourse measures for Task 1. Significant correlations emerged between Logical Memory (the average bits of information recalled from two stories read aloud) and total words ($r = .61$, $p < .05$) and the frequency of conjunctive ties ($r = .62$, $p < .05$). The following coefficients between forward digit span and three discourse measures were significant ($p < .05$): .63 for words per C-unit, .68 for accurate content units, and .60 for total cohesive ties. Only the number of conjunctive ties per C-unit was found to have a significant correlation with digit span backward ($r = .63$, $p < .05$).

Task 2: Retelling the Roger story. A number of highly significant correlations emerged between the discourse measures and performance on Logical Memory and Digits Forward for this task, as indicated in Table 22. Total speaking time correlated significantly with both Logical Memory ($r = .71$, $p < .05$) and Digits Forward ($r = .60$, $p < .05$). The total number of words was also found to have a significant correlation with Logical Memory ($r = .74$, $p < .01$) and Digits

Table 21
Pearson Product-Moment Correlation Coefficients Calculated Between the Three Tests of Auditory Verbal Memory Span (Wechsler, 1945) and the Discourse Measures for the Comic Strip Narratives (Task 1) of the Closed Head Injured Subjects

| Discourse Measure | Logical Memory | Digits Forward | Digits Backward |
|---|---|---|---|
| Productivity | | | |
| Time (in sec) | .13 | -.05 | -.02 |
| Total words | .61* | .48 | .18 |
| C-units | .55 | .13 | .17 |
| Words per C-unit | .25 | .63* | -.01 |
| Syllables per sec | .51 | .52 | .16 |
| % Syllables in Mazes | -.41 | -.28 | -.20 |
| Content | | | |
| Accurate Content Units | .44 | .68* | .04 |
| Inaccurate Content Units | -.22 | -.47 | .03 |
| Problems in Clarity | -.09 | -.13 | -.04 |
| Cohesive Ties per C-unit | | | |
| Reference | .28 | .48 | .08 |
| Conjunction | .62* | .51 | .63* |
| Lexical | .24 | .51 | -.13 |
| Total cohesive ties | .41 | .60* | .15 |

*$p < .05$
**$p < .01$
***$p < .001$

Table 22
Pearson Product-Moment Correlation Coefficients Calculated Between the Three Tests of Auditory Verbal Memory Span (Wechsler, 1945) and the Discourse Measures on the Narratives About Roger (Task 2) of the Closed Head Injured Subjects

| Discourse Measure | Logical Memory | Digits Forward | Digits Backward |
|---|---|---|---|
| Productivity | | | |
| Time (in sec) | .71* | .60* | .52 |
| Total words | .74** | .73** | .36 |
| C-units | .43 | .80** | .19 |
| Words per C-unit | .52 | .04 | .47 |
| Syllables per sec | .50 | .65* | .10 |
| % Syllables in Mazes | -.01 | .28 | -.14 |
| Content | | | |
| Accurate Content Units | .89*** | .47 | .44 |
| Inaccurate Content Units | -.53 | .24 | -.16 |
| Problems in Clarity | -.40 | .51 | -.06 |
| Cohesive Ties per C-unit | | | |
| Reference | .77** | -.13 | .30 |
| Conjunction | .46 | .42 | .30 |
| Lexical | .58 | .22 | .49 |
| Total cohesive ties | .79** | .13 | .45 |

*p < .05
**p < .01
***p < .001

Forward ($r = .73$, $p < .01$). The number of C-units was highly correlated with the forward digit span, $r = .80$ ($p < .01$). The rate of speaking (syllables per second) was moderately related to both Logical Memory ($r = .50$) and Digits Forward ($r = .65$), but only the latter attained significance ($p < .05$).

The fact that the number of accurate content units was highly correlated with Logical Memory ($r = .89$, $p < .001$) is not surprising as the two are similar measures for similar tasks. Low positive correlations occurred between accurate content units and the two digits span scores (.47 for Digits Forward and .44 for Digits Backward). Both reference ties per C-unit and total cohesive ties per C-unit highly correlated ($p < .01$) with Logical Memory ($r = .77$ and .79, respectively).

Task 3: How to buy groceries. As shown in Table 23, only two significant correlation coefficients were obtained between the discourse measures for the procedural task and the three memory scores. The number of C-units correlated with Digits Forward ($r = .65$, $p < .05$), and the frequency of conjunction cohesion correlated with Digits Backward ($r = .62$, $p < .05$).

## Intercorrelations Between Language and Memory Measures

Intercorrelations among the language and memory scores of the CHI subjects are displayed in Table 24. The Logical Memory subtest of the Wechsler Memory Scale was significantly correlated with Digits Backward ($r = .66$, $p < .05$) and the language measures of content ($r = .77$, $p < .01$), fluency ($r = .60$, $p < .05$), and naming ($r = .59$, $p < .05$). In addition, positive but nonsignificant ($p > .05$) correlations were found

Table 23
Pearson Product-Moment Correlation Coefficients Calculated Between the Three Tests of Auditory Verbal Memory Span (Wechsler, 1945) and the Discourse Measures on the Procedural Discourses (Task 3) of the Closed Head Injured Subjects

| Discourse Measure | Logical Memory | Digits Forward | Digits Backward |
|---|---|---|---|
| Productivity | | | |
| Time (in sec) | .39 | .21 | .49 |
| Total words | .49 | .51 | .21 |
| C-units | .09 | .65* | .06 |
| Words per C-unit | .59 | -.04 | .33 |
| Syllables per sec | .10 | .39 | -.45 |
| % Syllables in Mazes | -.04 | .02 | .14 |
| Content | | | |
| Accurate Content Units | .32 | .51 | .25 |
| Inaccurate Content Units | -.56 | -.21 | -.58 |
| Problems in Clarity | -.37 | .48 | -.23 |
| Cohesive Ties per C-unit | | | |
| Reference | .01 | .04 | -.20 |
| Conjunction | .42 | .49 | .62* |
| Lexical | .36 | .15 | .19 |
| Total cohesive ties | .51 | .38 | .39 |

*p < .05
**p < .01
***p < .001

Table 24
Pearson Product-Moment Correlation Coefficients Between the Three Memory Measures (Wechsler, 1945) and the Adjusted Scores of the Subtests of the Western Aphasia Battery (Kertesz, 1982) for the Closed Head Injured Subjects

| | LM | DF | DB | Content | Fluency | Aud Comp | Repetition | Naming |
|---|---|---|---|---|---|---|---|---|
| LM | 1.00 | .22 | .66* | .77** | .60* | .52 | .51 | .59* |
| DF | | 1.00 | .06 | .46 | .54 | .44 | .47 | .36 |
| DB | | | 1.00 | .49 | .49 | .23 | .30 | .21 |
| Content | | | | 1.00 | .81** | .67* | .69* | .74** |
| Fluency | | | | | 1.00 | .21 | .62* | .29 |
| Aud Comp | | | | | | 1.00 | .53 | .96*** |
| Repetition | | | | | | | 1.00 | .66* |
| Naming | | | | | | | | 1.00 |

LM = Logical Memory
DF = Digits Forward
DB = Digits Backward
Aud Comp = Auditory Comprehension

*$p < .05$
**$p < .01$
***$p < .001$

with auditory comprehension ($r = .52$) and repetition ($r = .51$).

Little relationship existed between the forward digit span and the backward digit span for these subjects ($r = .06$, $p > .05$). Consistent low positive coefficients were obtained between Digits Forward and all the language subtests ($r$ ranging from .36 to .54, $p > .05$). Even lower, but still positive correlations were exhibited between Digits Backward and the five language scores ($r$ ranging from .21 to .49, $p > .05$).

As one might expect, many significant intercorrelations existed among the language measures. All correlation coefficients among the language subtest scores were positive and greater than .20. As shown in Table 24, the content rating was significantly related to all the other language scores, ranging from a Pearson $r$ of .67 ($p < .05$) with auditory comprehension to .81 ($p < .01$) with the fluency rating. This pattern of correlation is similar to the one obtained between the number of accurate content units on Task 2 and the language measures (see Table 19), substantiating the notion that content in verbal tasks such as conversational speech, simple picture descriptions, and retelling stories, is determined by global language abilities.

In addition to its high correlation with the content rating ($r = .81$, $p < .01$), the fluency rating was also significantly correlated with repetition ability ($r = .62$, $p < .05$). A strong relationship was demonstrated between the

auditory comprehension scores and the naming scores ($r = .96$, $p < .001$), indicating that the CHI individuals scored similarly on both subtests. Subjects with low auditory comprehension also experienced greater problems in naming. The r between naming and repetition was .66 ($p < .05$).

## Descriptive Analysis of the Discourse of the CHI Subjects

In examining the discourses produced by the CHI subjects and noting the large variability on the discourse measures, it became apparent that a wide range of discourse production abilities existed within this group. Three different profiles of performance on the discourse tasks have been selected to demonstrate this range of abilities.

Two particular profiles of discourse production were found among the individuals who scored the lowest on both the memory and the language testing. The first is characterized by a marked reduction in both the productivity and content of language. Three individuals, Subjects 1, 4, and 10, fit this pattern. These subjects spoke briefly and slowly, even in comparison to other CHI subjects, and produced only a few short communication units for each discourse. Unlike the subjects in the other two patterns, these individuals exhibited few disfluencies.

The discourses of these three individuals contained content which was very limited and concrete. On the comic strip task, they described events in a few pictures but failed to incorporate all of the pictures in developing a story.

Very limited information was provided in retelling the Roger story. When prompted by specific questions, however, they did recall additional details. On the procedural discourse, these subjects required a prompt "Anything else?" to completely explain how to buy groceries. The number of the accurate content units they produced on their own was therefore limited, and inaccuracies or vague clauses were also found.

The subjects in the first profile also used fewer cohesive ties per C-unit when compared to the normal speakers and even tended to use fewer cohesive ties than did other CHI speakers. Of interest is the fact that all three had mild dysarthria and flat affect and two of the three had documented focal frontal lobe damage. Transcripts of discourses which exemplify this profile are included in Appendix L-1.

The second profile of discourse performance also involved individuals who scored the lowest on the language and memory testing. This profile is based on the performance of two CHI speakers, Subjects 3 and 6, and can best be characterized as "confused discourse." They frequently used inaccurate content and exhibited many problems in the clarity of reference. Their rate of speech was close to that of normal speakers, but one fourth to one third of their syllabic output consisted of mazes, or repetitions, filled pauses, and revisions. They appeared to start in one direction and then shift to another, leaving the listener uncertain as to the intended meaning. Confabulatory responses and frequent use of nonindexed or ambiguous pronouns occurred. Despite the confused content and

disfluent speech, these individuals used more cohesive ties per C-unit than did the previous group although fewer than the normal subjects. Examples of discourses for this profile are found in Appendix L-2.

The best performance on the discourse tasks was obtained from the two subjects whose post-onset times were the longest. Both Subject 5 and Subject 10 were tested approximately a year and a half after their accidents. Neither exhibited any dysarthria, and both scored high on the Western Aphasia Battery (Aphasia Quotients of 96.8 and 96.2, respectively). The only language deficits noted for these subjects were decreased fluency of spontaneous speech and decreased naming abilities. Subject 5 experienced problems on the Wechsler Memory Scale subtests of Logical Memory (score of 7) and Digits Backward (score of 0), but she recalled seven digits in the forward order. Subject 10 received memory scores similar to those of normal subjects.

For both of these subjects, their discourses contained all the correct content units, no inaccurate content units, and cohesive ties in the same frequency as normal subjects. In addition, their productivity was similar to that of normal speakers with the exception that a greater percentage of their syllables occurred in mazes. In other words, their discourses were comparable to those of normal speakers in every respect except they contained more disfluencies (more repetitions, filled pauses, and revisions). Although not measured in this study, Subject 10 spent an inordinate amount of time planning

her discourse prior to the initiation of speaking. On Task 1, she spent over one minute studying the comic strip before telling a story based on it. Therefore, it appears these subjects produced almost normal discourse but with less efficiency and fluency. The three discourses produced by Subject 10 are given in Appendix L-3.

The remaining four subjects had characteristics of all three patterns. Whether these are discrete patterns and are characteristic of the CHI population as a whole is not known. It is likely that other patterns would emerge with a larger sample. Nevertheless, the presently described profiles of discourse performance do suggest the nature of the variability which exists among CHI patients. Examples from the discourses of the normal speakers are placed in Appendix L-4 for comparison to those of the experimental subjects.

## CHAPTER IV
## DISCUSSION

In this chapter the main findings of this study are discussed, interpreted, and related to previous research. The purpose of this investigation was to examine the ability of individuals who have sustained a closed head injury to produce narrative and procedural discourse and to relate their discourse performance to their language and memory abilities.

### Discussion of Subject Characteristics

The CHI subjects in this study were similar in their demographic features to CHI individuals in previous investigations of the language impairments following CHI. Their mean age was approximately the same as that of the subjects of Sarno (1980) and Levin et al. (1976). As in all previous research, more subjects were male than female. The mean length of coma for the current subjects, however, was longer than that for the subjects in the studies of Levin et al. (1976, 1979, 1981) and Groher (1977). The majority of them appeared to have experienced a severe head injury, as judged by the extended length of coma. This characteristic is most likely related to the fact that the primary source of subjects was a rehabilitation center. Nevertheless, as a

whole, these subjects were less severely injured than the subjects tested by Sarno (1980), Thomsen (1975), and Najenson et al. (1978). Due to the similarity of the current subjects with other CHI patients, one can conclude that the results of this study are generalizable.

## Language Functioning

The present CHI subjects' similarity to those of previous research was also evidenced in their pattern of language abilities. All, regardless of the length of coma, had some degree of language impairment. As in the work of Levin and his associates (1976, 1981), verbal repetition was found to be virtually intact for all subjects, and auditory comprehension was relatively normal except for complex commands. The aspects of oral language abilities found to be most consistently and severely impaired were naming and verbal fluency, once again, comparable to the findings of Levin et al. (1976, 1979, 1981).

Only five subjects exhibited language problems severe enough to be classified as having aphasia. Based on Kertesz's (1982) taxonomic table, all five would be placed in the category of anomic aphasia.

## Memory Abilities

The memory abilities of the CHI subjects were like those previously reported for this population (Brooks, 1972 and 1975). Each of the three aspects of auditory verbal memory

tested (memory for information from stories read aloud, digit span forward, and digit span backward) was impaired as compared to the performance of the control subjects. These findings corroborate those of Brooks (1975) who also found the subtests of the Wechsler Memory Scale (WMS) to be sensitive to the effects of closed head injury. Earlier, Brooks (1972) reported that the forward span of his CHI subjects was comparable to that of his control subjects in contradistinction to the backward span which was significantly impaired. The present data support the finding that CHI individuals perform closer to normal subjects on tests of forward digit span. This outcome is as expected since reversing digits demands greater concentration, a strategy for rehearsal and retrieval, and more long-term retention, than does repeating digits forward.

The CHI subjects had significant problems in recalling specific information from stories read aloud to them on the Logical Memory portion of the WMS. Confabulation and vague reponses were common for CHI subjects on this subtest. Unlike the control subjects, they "invented" information upon failure to recall the actual content of the stories.

Whereas the control subjects experienced a significantly greater memory span for information in narratives as compared with digits forward, the CHI subjects recalled essentially the same number of information units whether the stimulus was a story or a series of digits. Problems in linguistic processing could be one factor. However, the sensitivity of

the CHI subjects' processing system to an overload of information, as in the lengthy stories, was another likely factor.

## Discourse Performance After Closed Head Injury

Although there have been no prior objective investigations of the discourse abilities of CHI patients, reported observations of their spontaneous speech have indicated that aberrations exist. The present results provide clear evidence that CHI patients have significant impairments in their abilities to produce narrative and procedural discourse. These impairments are global in nature and involve various aspects of productivity, content, and cohesion.

### Productivity

Not all aspects of productivity were depressed in both narrative and procedural discourse. Although the CHI narratives were approximately the same length in seconds as the discourses of normal speakers, the CHI subjects produced fewer meaningful words during that time. This relates to two other findings which were consistent with respect to all three discourse tasks: (a) The CHI subjects had a slower rate of speech, and (b) a significantly greater percentage of their output occurred in mazes. The presence of dysarthria was no doubt a contributing factor in the reduced rate of speech. It should be noted, however, that a general "slowness" is the behavioral characteristic of CHI patients most frequently

reported by relatives (McKinlay et al., 1981). A reduced speed in movements and thinking is a common complaint and may be contributing to this reduced rate of speaking. Depressed naming ability is also related to this charateristic. Levin et al. (1981) reported that reduced verbal fluency was associated with a reduced rate of speaking in their CHI subjects.

The CHI subjects consistently exhibited more "hesitation phenomena," a second factor contributing to reduced productivity. A greater percentage of their production in both narrative and procedural discourse consisted of mazes, or fillers, revisions, and repetitions, as compared to the output of the normal speakers. As a result, more of their output was nonmeaningful, thereby failing to contribute to the forward progress of the semantic content of the discourse. The result often was a choppy and fragmented discourse.

Loban (1976) suggested that the percentage of words in mazes may be related to verbal planning and word fluency and that the average number of words per communicaion unit is an important measure of fluency. In his study of language development in school-aged children, Loban found that children who were rated by their teachers to have a high degree of organization, control and effectiveness in their communication were the chidren who were the most "fluent" in their oral language, i.e., used more total words, used more words per C-unit, and had fewer words in mazes.

The CHI subjects produced approximately the same number of communication units as normal speakers on the narrative tasks, yet used significantly fewer words per C-unit. This suggests that the CHI speakers used less complex syntactical organization in their narratives as compared to normal speakers.

The procedural task produced a somewhat different picture. The CHI subjects spoke for less time and produced fewer communication units than normal subjects in describing how to buy groceries. Although they used fewer words per C-unit on the average than normal speakers in their procedural discourse, the difference failed to reach significance. In part, then, these data suggest that when the communication situation is largely unstructured, CHI individuals are likely to limit the quantity of their verbal expression.

Unlike the normal speakers, the CHI subjects varied their productivity little between the narrative and procedural tasks. The only significant difference on the productivity measures across tasks for the CHI subjects was the rate of speech. The CHI speakers spoke more slowly on Task 1, the comic strip narrative, than they did on the other two tasks. It is likely that their difficulty in interpreting the comic strip contributed to this finding. The normal speakers, on the other hand, produced significantly more discourse on the procedural discourse, i.e., they spoke longer and produced more words and C-units. Without the structure provided in the

other two tasks, they appeared to have attempted to cover as many details as possible in telling how to buy groceries.

The present findings regarding productivity are comparable to those of other studies with brain-damaged individuals. Ulatowska et al. (1981) reported that mildly aphasic individuals used fewer words per utterance in both narrative and procedural discourse than normal speakers. The mildly aphasic subjects in Yorkston and Beukelman's 1977 study produced only about half the number of syllables per minute generated by normal speakers. Likewise, Golper et al. (1980) found that both mildly aphasic individuals and nonaphasic patients with right hemisphere damage produced fewer syllables per minute and shorter utterances when compared to age-matched normal speakers. With respect to maze behavior, the mildly aphasic individuals exhibited a greater number of fillers, revisions, and repetitions than did the other two groups. Also in keeping with these general findings is Shekim's (1983) study of patients with Alzheimer's disease. She reported that her patients exhibited a slower rate of speech, fewer words per C-unit, and more maze behavior than age-matched control subjects.

## Content

The results of the content analyses indicated that CHI individuals produced only one half to two thirds the amount of accurate content produced by normal speakers. Unlike the control subjects, the CHI subjects introduced inaccurate

content into their two narrative discourses. This finding is similar to the results on the Logical Memory subtest of the Wechsler Memory Scale.

Possible explanations for these findings require examination of the individual tasks. The low amount of accurate content and high false content on the comic strip narrative can partially be regarded as a failure to interpret the visual stimulus correctly or failure to determine the most relevant aspects of the pictures.

Bizarre or unusual interpretations of the comic strip were not uncommon for the present CHI subjects, even those whose language content was at least acceptable albeit limited on the other two tasks. This did not appear to be related to visual field cuts or to double vision. When a CHI subject was noted to be having difficulty on this task (Task 1), the experimenter repeated the instructions and made sure the subject examined the entire stimulus.

Problems in the interpretation of complex visual information, sequencing, and synthesis have been reported in this population. Uzzell, Zimmerman, Dolinskas, and Obrist (1979) found the Picture Arrangement subtest of the Wechsler Adult Intelligence Scale to be the Performance subtest exhibiting the greatest posttraumatic deterioration for individuals with either localized left or right hemisphere damage. This subtest requires the subject to place line drawings in the correct order to tell a story. Cognitive abilities necessary for performance on this subtest are

similar to those for the task of generating a story about a comic strip.

In fact, deficits in visual processing would not be unexpected in the current subjects. The right hemisphere is the primary hemisphere for the processing of nonverbal visual stimuli, and at least five subjects had CT scans which diagnosed the presence of right hemisphere abnormalities.

The reduced amount of accurate content and increased inaccurate content on the second narrative, retelling the Roger story, can be attributed to the auditory verbal memory deficits of the CHI patients. On several occasions following this task, the investigator probed subjects after termination of their discourses was clearly evident. It was found that they answered questions concerning events in the story with the correct specific content despite their inability to generate this information spontaneously.

Although the content of Task 2 discourses was reduced as compared to normal speakers, the CHI subjects did utilize more of the established content units in retelling the Roger story than they did for the two other tasks. However, due to the large variability this difference was not significant. The control subjects, on the other hand, demonstrated significant differences in the amount of content on each task, reflecting the variability in the maximum number of content units established for the three tasks.

In regard to Task 3, inaccurate content was less apparent, probably because the procedure involved describing

the relatively concrete, everyday activity of buying groceries.

When compared to normal subjects, CHI speakers exhibited significantly more problems in the clarity of expression in two of the discourse tasks (the comic strip story and the procedure) and a trend in this regard in retelling the Roger story. The most frequently found problems in clarity were the use of vague clauses and the use of ambiguous or nonindexed pronouns, with 13 instances of the first and 48 of the latter. Four instances of paraphasias and eight instances of indefinite words occurred in the discourses of the CHI subjects. No significant differences between tasks emerged on the measure Problems in Clarity of Reference for the experimental subjects. The normal subjects, however, displayed significantly more instances of this category in their procedural discourses than in either of their narratives. They appeared to have assumed that the experimenter had some prior knowledge of grocery stores.

Investigations into the semantic content of the discourses of mildly aphasic subjects have employed dissimilar approaches with results which conflict with the present findings. Yorkston and Beukelman (1980) found that the number of concepts, or target words, produced by mildly aphasic speakers did not differ significantly from the number produced by normal speakers. However, the efficiency of production was substantially reduced, i.e., more time and more words were needed to express the same number of concepts. Ulatowska et

al. (1981) investigated the content of the narrative and procedural discourses of mildly aphasic subjects by examining the elements of the superstructure and concluded that they produced all the important elements in both narrative and procedural discourse but used less language and included fewer nonessential bits of information.

Berko-Gleason et al. (1980) utitlized a somewhat similar approach as the present one except that the main themes were established by the researchers. The moderately severe aphasic (both Broca's and Wernicke's) subjects of their study expressed fewer than half the mean number of main themes found in the discourses of the normal subjects.

Cohesion

According to Halliday and Hasan (1976) cohesive ties are surface structure features which establish connectivity between utterances in a discourse, thus giving it "texture." Although CHI individuals used cohesive ties, they used significantly fewer of them per communication unit in both narrative and procedural discourse than did normal speakers. This provides evidence that their discourse lacks continuity.

The reduction in cohesion is partially related to the previously mentioned finding that CHI speakers experience difficulty in the clarity of references. That is, instances of ambiguous or nonindexed pronouns can be thought of as failures to establish cohesion. The anaphoric reference

intended with a pronoun was not completed because the speaker failed to supply the listener with a referent.

Both groups relied on cohesive ties more often in their narratives than in their procedural discourse. On the two narrative tasks, CHI failed to use as many instances of reference cohesion per C-unit as the normal speakers did. Little can be said about the categories of substitution and ellipsis since such low frequencies occurred. Although CHI subjects used fewer conjunctive and lexical ties than control subjects on all three discourse tasks, the difference was statistically significant for conjunctive ties only on the Roger narrative and for the lexical ties only on the Roger story and the procedural discourse.

In discourse analyses with other populations, similar results have been obtained. Rochester, Thurston, and Martin (1979) found that schizophrenic speakers used fewer cohesive ties than normal speakers and that more cohesive ties were used by both groups in narratives than in interviews. Unlike the present speakers, their schizophrenic speakers used a greater proportion of lexical cohesion than any other type of cohesion. Shekim (1983) found that patients with Alzheimer's disease also used fewer cohesive ties per communication unit.

In summary, the CHI subjects examined here produced discourse which was reduced in terms of its quantity (i.e., number of words per discourse), efficiency (decreased rate and increased disfluency), complexity (based on the number of words per C-unit), content, and connectivity (cohesion). They

experienced difficulty in maintaining clear references and introduced inaccurate content more often. Their reduction in discourse abilities appeared to be global in nature as there was little variability across discourse genres. Cognitive deficits, particularly in planning, interpretation of complex visual stimuli, processing speed, and memory, as well as linguistic deficits appeared to be related to their performance. Some of these factors were examined further through correlational analyses.

Relationships Among Memory, Language, and Discourse Abilities

The correlational analyses indicated that many aspects of the CHI subjects' discourse performance were related to language abilities, but the pattern and strength of the relationships varied with the task. The highest degree of relationship was demonstrated on the narrative produced by retelling a story presented auditorily (Task 2). The processing required by such a task involves the translation of auditory verbal input to oral verbal production.

A weaker relationship between discourse performance and language abilities was attained on Task 1 where the subject had to derive meaning from a complex visual pictorial stimulus and then convert these thoughts into oral verbal output. The fewest number of significant correlations appeared on the procedural discourse. In generating this discourse, the subject had to recall prior experience with buying groceries from long-term memory, sequence the activities, and produce a spoken verbal response.

The extremely strong relationship between the two spontaneous speech ratings and the discourse measures on Task 2 indicates that these two WAB rating scales are valid estimates of discourse abilities for simple verbal tasks. This relationship did not hold in the other two tasks, suggesting that factors other than linguistic abilities, such as social or cognitive factors, significantly influenced performance.

The discourse measures showing the most consistent, significant positive relationship with language abilities were total words, the average length of the C-unit, accurate content units, and total coesive ties per C-unit. The percentage of syllables in mazes was inversely related to auditory comprehension and naming skill on all three tasks, although the coefficients attained significance only for Task 1 and Task 3.

A stronger relationship between memory and discourse performance was demonstrated on the Roger narrative than on the other two tasks. This is as expected due to the memory component of this task. The number of accurate content units was highly related to Logical Memory for Task 2 and moderately related to forward digit span for Task 1. The two discourse measures demonstrating the greatest number of significant relationships to memory abilities were Total Words and Conjunctive Ties per C-unit. For both narratives the number of words produced was related to memory abilities such that the higher the memory score, the more words produced. The

discourse measures were generally more related to Logical Memory and Digits Forward than to Digits Backward. Very little relation between the procedural discourse measures and the memory scores was detected.

A number of intercorrelations among language skills and memory span were found. Of the three memory tests, only Logical Memory, which required the recall of information from a story, was related to verbal expressive language. The performance of the CHI subjects on Logical Memory was significantly related to their performance on Digits Backward but not on Digits Forward. Of all the language measures, the Content rating showed the strongest relationship with the other language scores. An extremely strong relationship emerged between auditory comprehension and naming.

# CHAPTER V
# IMPLICATIONS AND CONCLUSIONS

## Clinical Implications

This study represents progress toward delineating the communication problems of persons who have sustained a closed head injury, and it has important implications for assessment and treatment. As observed by Stanton, Yorkston, Aune, and Hedges (1980), speech-language pathologists lack assessment tools for head trauma patients which target functional therapy goals. Moreover, traditional standardized procedures do not necessarily predict behavior in real life situations for CHI individuals. The present research has shown that investigation of language beyond the single sentence level is appropriate and clinically relevant in that the methods were successful in highlighting aspects of discourse performance at variance with "normal" discourse production. As a result, information is gained which can be employed by speech-language pathologists in language intervention for CHI patients.

The methods used to elicit discourse in this study appear to be fruitful ones, particularly those tasks designed to elicit narrative discourse. The task of retelling a story resulted in a discourse strongly related to language and

memory abilities. The comic strip task pinpointed individuals experiencing difficulty in translating complex visual information into verbal expression. The procedural task produced less reliable results in terms of segmentation of the discourse into utterances and coding of the cohesion measures. Altering the instructions to the subjects could improve the former problem. The data suggest that cohesion is not used as frequently even by normal subjects on procedural discourse as compared to narrative discourse and therefore may not be as relevant a measure for this type of discourse.

The correlational data indicated that the two rating scales of spontaneous speech from the Western Aphasia Battery correlated highly with many of the discourse measures for narratives based on information previously heard. In addition, the discourse measures of total words, words per C-unit, percentage of syllables in mazes, accurate content units, and total cohesive ties per C-unit were the measures with the strongest relationship to language abilities. To expedite the evaluation process for the clinical setting, scoring of only these measures could be employed as they appear to be the ones most indicative of linguistic skills.

Ochs (1979) noted that many features of child language are found in the unplanned discourse of normal adult speakers. These include (a) less complex syntactic structures, (b) reliance on immediate context to express relationships between propositions, (c) greater use of deictic terms, (d) fewer instances of cohesion, and (e) frequent use of "repair

mechanisms." The characteristics of CHI discourse isolated in this study are strikingly similar. Though these features may occur in normal speakers, they appear to be particularly characteristic of the language of CHI patients.

Ochs suggested that situational or conceptual demands may interfere with the planning of propositions and cause speakers to resort to developmentally earlier communicative strategies. This may account to some degree for the performance of the CHI subjects; discourse production places greater demands on their reduced cognitive and linguistic processing systems. Ochs also suggested that planned language usage draws on knowledge which is acquired later in life and partially through formal education. This implies that the language abilties of CHI patients has been reduced to earlier developmental stages and that re-education may improve their performance.

From the results of this study, it appears that analysis of discourse is a useful clinical tool for evaluating a broad range of language, social, and cognitive functions and determining deficit areas. Treatment should address each of these functions in order to build more effective communication. This study suggests that methods for reducing disfluencies and for increasing the amount of output, the syntactic complexity, and cohesion would be appropriate. In addition, focusing on the adequate transfer of semantic content and clarity of reference would be relevant in the treatment program. Social aspects of communication include appreciating the listener's viewpoint and knowledge. This may

mean helping the speaker learn to judge his own performance and to become aware when a burden is placed on the listener to make the unspecified inferences and connections between utterances. Cognitive factors which influence discourse include attention, organization, sequencing of ideas, interpretion of complex visual pictures, and memory. Strategies for organizing discourse, such as the discourse grammars, would be helpful as well as ways to facilitate the recall of information. Visual as well as verbal material should be included in therapy.

## Implications for Future Research

This research is only a first step toward understanding the communication problems resulting from closed head injury. Many other areas are in need of investigation. A grammatical description of CHI language production has yet to be provided. Holland (1982) has reported that grammatical aspects of language are relatively spared following CHI. Instances of agrammatism in this study were limited to only two CHI individuals who produced very sparse language (individuals in the first profile described in Chapter IV). However, the present data suggest that the grammatical complexity of CHI subjects' utterances is reduced. Loban (1976) found that the measure of words per C-unit produced approximately the same results as his complex scale for determining the degree of syntactical elaboration in school-aged children. Although the grammatical structure of the communication units was not

specifically studied in this study, the CHI subjects used shorter C-units in their narratives and fewer conjunctive cohesive ties in the narrative tasks. Additional research, therefore, is needed to fully investigate the syntactic organization of the communication units produced by CHI subjects.

Few problems were noted in the discourse of CHI subjects in terms of logical sequencing of events or in the inclusion of irrelevant comments. This might be due to the relatively structured nature of the testing procedure used in this study. Research is needed with more difficult discourse tasks and in less structured settings to further examine these deviations which were described as being charteristic of this population.

Dialogic discourse might be particularly revealing of the pragmatic aspects of the communication problems following CHI. Turn-taking abilities, delays in responding, monologic behavior, topic maintenance, and inappropriate responses could be explored in conversations and have the potential for yielding fruitful results. The content of spontaneous conversation is less predictable even for normal speakers and therefore cannot be anticipated and organized. CHI speakers may be expected to have even greater difficulties with this type of discourse.

This study offers some observations on the relationship between neurological damage and language deficits following closed head trauma. The literature suggests that mild problems in verbal fluency cannot be attributable strictly to

left hemisphere damage or even to a primary language disturbance (Golper et al., 1980). The present study supports such a conclusion. The CHI subjects demonstrated significant reductions in their language abilities, i.e., in naming, sentence complexity, and verbal fluency, yet the majority of them (nine of eleven) had CT scans which indicated right hemisphere damage or exhibited signs of focal right hemisphere damage, such as left hemiparesis or left visual field deficits. Because the depression of discourse performance was global in nature and because both language and memory skills were related to discourse ability, it is most likely that the discourse impairments are the result of diffuse brain damage. This corroborates the finding of Levin et al. (1981) that generalized language problems following CHI correlate highly with severe diffuse brain damage.

## Summary and Conclusions

In the present study, the narrative and procedural discourse production abilities of individuals who had sustained a closed head injury were compared to those of normal speakers, and the relationships among discourse production ability, oral language functioning, and auditory verbal memory span following CHI were examined. Two narratives and one procedural discourse were elicited from each subject. The three discourse tasks included telling a story based on a comic strip, retelling a story presented auditorily, and telling how to buy groceries. In addition,

all subjects were administered three tests of auditory verbal memory span from the Wechsler Memory Scale (Wechsler, 1945), and the experimental subjects were given the oral language portion of the Western Aphasia Battery (Kertesz, 1982).

The results indicated that the discourses produced by the CHI patients were significantly different from those of the normal subjects. However, there was significant interaction between the groups and the tasks, making it difficult to draw straight-forward conclusions. The results can by summarized as follows:

1. The CHI individuals all had some degree of oral language deficit. The most consistently and severely impaired aspects of language were fluency of spontaneous speech and naming, whereas the least depressed aspects were repetition and auditory comprehension. However, less than half the subjects met Kertesz's (1982) criterion for determining the presence of aphasia.

2. The CHI subjects were significantly impaired on all three tests of auditory verbal memory span. More difficulty, however, was experienced in recalling information from a story (the Logical Memory subtest) and in repeating digits backward than in repeating digits forward. Unlike the normal subjects who experienced significantly greater recall for information from a story than for a series of digits, the CHI subjects performed essentially the same on these two tests of memory span.

3. In all three discourse tasks, the CHI subjects showed signs of decreased productivity. The narrative discourses of CHI individuals were the same length in terms of time and number of communication units as the narratives of normal speakers. However, the CHI subjects produced fewer meaningful words: A greater percentage of their syllabic utterances were disfluencies, or mazes, and their rate of speaking was slower. Also in the narratives, the CHI subjects produced shorter sentences (fewer words per communication unit) as compared to normal subjects. On the other hand, the procedural discourses of CHI individuals were shorter in time and in the number of communication units when compared to normal speakers. Although there was no significant difference in the length of communication units for the two groups on the procedural discourse, CHI subjects did produce fewer words overall. Again, they spoke at a slower rate, and a greater percentage of their syllabic utterances fell into mazes.

4. The narrative and procedural discourses of CHI subjects contained fewer accurate content units than those of normal speakers. This could not totally be accounted for by their reduced productivity since many of their communication units contained inaccurate content units and vague clauses. Problems in memory and in the interpretation of complex visual information were partially responsible for the occurrence of inaccurate content in the two narrative discourses. There was no significant difference between the two groups in the frequency of inaccurate content units on the procedural

discourse. Problems in the clarity of reference, i.e., use of vague phrases, indefinite words, ambiguous pronouns, deictic terms, and paraphasias, occurred significantly more often in the discourses of the CHI subjects on two of the three tasks.

5. In both narrative and procedural discourse, the CHI subjects used fewer cohesive ties per communication units, as compared to the normal subjects. However, both groups relied less often on cohesive ties in their procedural discourse than in their narratives. Differences occurred between the groups by the type of cohesive tie, but this varied from task to task. For the procedural discourse task, a significant difference between the two groups was found only for lexical cohesion. In their narratives based on the comic strip, the CHI individuals used fewer reference ties per communication unit than did the normal speakers. On the second narrative task, retelling the Roger story, the CHI individuals produced significantly fewer cohesive ties per communication unit in each of the four categories used (no instances of substitution occurred for either group).

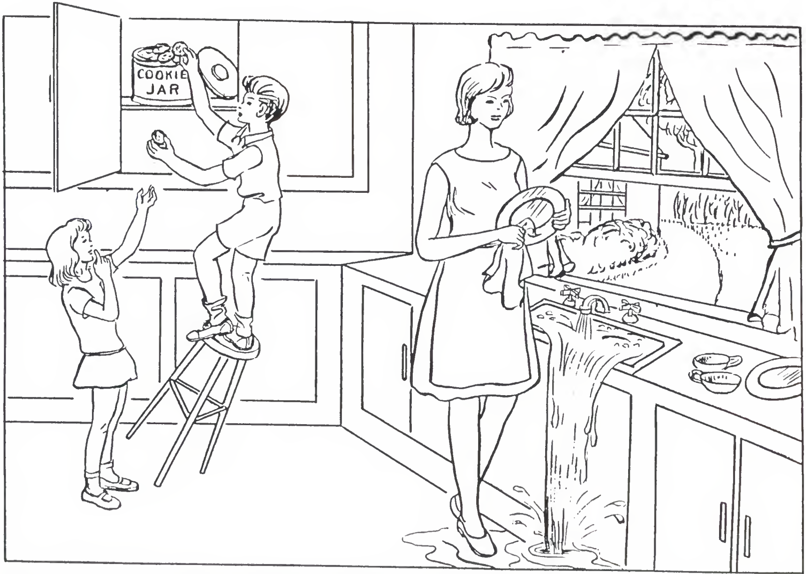
6. The CHI subjects exhibited little variability in their performance across the three tasks, i.e., significant differences in productivity and content between tasks were rare. The CHI individuals employed a slower rate of speaking on the comic strip task and more instances of cohesion per C-unit in their two narratives. On the other hand, the control subjects demonstrated significant differences across the tasks on seven of the eleven discourse measures.

Generally, these differences were such that performance varied by discourse genre. In other words, performance on the two narratives was essentially the same, but each narrative differed significantly from the procedural discourse.

This description of the discourse abilities of persons who have sustained a CHI, based on the results of this study, offers a start toward understanding the communication problems faced by these individuals. The pattern that emerges is one of reduced verbal language functioning which is limited in its productivity and efficiency on several levels. It is reduced in terms of the amount of meaningful words, the length of the sentences, the amount of accurate content, connectivity (cohesion), and ability to adjust to task requirements. It is inefficient in that (a) it is produced more slowly, (b) it has more repetitions, hesitations, revisions, and fillers, and (c) it contains unimportant, vague or inaccurate semantic content.

It is hoped that this study will serve to prompt additional research in this area and provide some insights to clinicians working with patients who have closed head injuries. Future investigations with larger samples will be necessary to discover the full range of discourse abilities in this population and to develop additional methods for eliciting and for analyzing their discourse.

APPENDIX A
COOKIE THEFT PICTURE (GOODGLASS & KAPLAN, 1972)




Note: From the Boston Diagnostic Aphasia Examination by H. Goodglass and E. Kaplan, 1972, Philadelphia: Lea and Febiger. Copyright 1972 by Lea and Febiger. Reprinted by permission.

## APPENDIX B
## SCALE FOR DETERMINING SOCIOECONOMIC STATUS. ADAPTED FROM BLAU AND DUNCAN (1967)

Higher white-collar

- Professional, technical and kindred workers
- Managers, official, and proprietors, except farm

Lower white-collar

- Sales workers
- Clerical and kindred workers

Higher manual

- Craftsmen, foremen and kindred workers

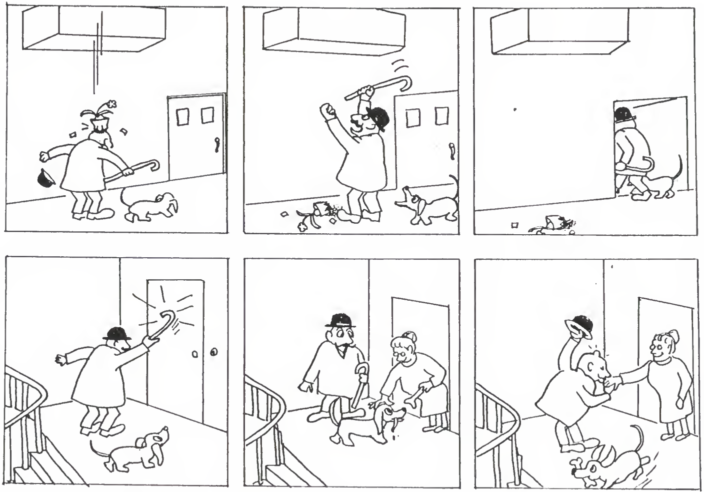
Lower manual

- Operatives and kindred workers
- Service workers
- Laborers, except farm

Farm

- Farmers and farm managers
- Farm laborers and foremen

APPENDIX C
COMIC STRIP USED IN TASK ONE



Note: From <u>So ein Dackel! 22 Bildergeschichten fur den Sprachunterricht</u> by H. Kossatz, 1972, Munchen, West Germany: Tomus-Verlag. Copyright 1972 by Tomus-Verlag. Adapted by permission.

## APPENDIX D
## TEXT FOR TASK TWO: THE ROGER STORY

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One night Roger was on the outskirts of the city, waiting for a bus. A beggar approached and asked him for some money. Feeling happy and kindly toward the world, Roger emptied the change from his pocket into the beggar's outstretched hand. Without saying a word, the beggar shuffled away. Suddenly, Roger realized the mistake he had made. He could not ride the bus without the exact fare of fifty cents. He called the beggar back, told him his predicament, and asked him to return two quarters. The beggar smiled and replied, "I'll be glad to <u>sell</u> you two quarters for a dollar."

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Note. Reprinted and adapted by permission of the publisher from William A. McCall and Lelah Mae Crabbs, STANDARD TEST LESSONS IN READING (New York: Teachers College Press, c 1926, 1950, 1961, 1978, 1979 by Teachers College, Columbia University, All rights reserved.), Book E, page 18.

# APPENDIX E
# SUBJECT INFORMATION SHEET

SUBJECT INFORMATION SHEET

Subject # ____

NAME: ______________________________ BIRTHDATE: __________

ADDRESS: ____________________________ AGE: _____ SEX: _____

____________________________ PHONE: ____________

HISTORY

Education: __________________________ Handedness: __________

Occupation: ________________________________________________

Normal hearing?____ Normal vision?____ Normal language/I.Q.?____

History of previous trauma, CVA, diabetes, alcohol/drug abuse?

____________________________________________________________

CLOSED HEAD TRAUMA INFORMATION

Etiology: __________________________________________________

Date of injury: __________________ Time Since Onset: ________

Length of coma: __________________ Glascow Coma Scale: ______

Immediate consequences: ____________________________________

Skull fracture? _______________ Hematoma? _________________

Motor deficits: ____________________________________________

Sensory deficits: __________________________________________

Visual deficits: ___________________________________________

Neuroradiologic findings: __________________________________

____________________________________________________________

TESTING INFORMATION

Date tested: _______________________________________________

Orientation: Person _____ Place _____ Time _________________

Order of Presentation of Tasks: Comic Strip ________________

Retelling story ________ Procedure ____________________

Comments: __________________________________________________

APPENDIX F
INSTRUCTIONS TO SUBJECTS
AND PROCEDURES FOR ELICITATION OF DISCOURSE

I am interested in your ability to tell stories and give explanations. You will be asked to do three talking tasks. Are you ready?

Task #1: Comic strip. (The investigator, sitting directly facing the subject, places the comic strip in front of the subject and out of the investigator's view on order to discourage pointing behavior.) Look at all of these pictures and tell me a story based on the entire series of pictures.

Task #2: Retelling a story. I want you to listen to this story someone else has recorded and then tell it to me in your own words as though I have never heard it before. (Investigator then puts earphones on subject so only he/she hear it. When tape is over, the investigor takes the earphones off the subject.) Now tell me that story.

Task #3: Procedure. Pretend I am from some strange place that I have never heard about supermarkets. Tell me how to go about buying groceries in an American supermarket.

# APPENDIX G
## SYMBOLS USED IN TRANSCRIPTION OF DISCOURSES

1. / Indicates end of independent thought or sentence as signaled by the speaker's drop in intonation and pausing.

2. { } Enclose statements made by the examiner or interruptions during the taping.

3. [ ] Enclose subject's nonverbal sounds such as laughs or coughs and statements made by the subjects but not considered part of the discourse, such as "Now, what else should I say?"

4. . Indicates pauses. One period per one second of pause.

5. , To indicate points where subject's brief pause or intonation suggest a phrase to be parenthetical or supplemental.

6. - Indicates revision.

APPENDIX H
PROPOSITIONS USED IN
DETERMINING NUMBER OF ACCURATE CONTENT UNITS

Task #1: Comic strip story

(1) There is a man.
(2) Man is walking down the street.
outside an apartment building.
(3) A flower pot hits him.
(4) It hits him on his head.
(5) He gets mad/yells/shakes his cane.
(6) He walks in building.
He decides to go find the culprit.
(7) He knocks/bangs on the door.
(8) A lady comes to the door.
(9) The lady gives the dog a bone.
The lady takes a liking to the dog.
The lady greets the man and dog.
(10) The lady and man become friends/make up.
The man thanks her.
The man is charmed/impressed/gracious/happy.

Task #2: Retelling Roger story

(1) There was a man named Roger.
(2) He was waiting on a bus.
at a bus stop.
(3) A beggar approached Roger.
(4) The beggar asked Roger for money.
(5) Roger got all his change.
(6) Roger gave the change to the beggar.
(7) The beggar walked away.
(8) Roger realized something.
(9) Roger had no money for the bus now.
(10) Roger called the beggar back.
(11) Roger asked for two quarters back.
told him his predicament.
(12) The beggar said he would sell him two quarters for a dollar.

Task #3: How to shop for groceries

(1) Find a store. or Go in a store.
(2) Get a cart.
(3) Walk up and down the aisles.
Go through the store.
(4) Get what you want/need.
(5) Go to the checkout.
(6) Pay for the groceries. or Make a purchase.
(7) Leave. or Take your groceries out/to the car.

## APPENDIX I
## CATEGORIES OF COHESION DERIVED FROM HALLIDAY AND HASAN (1976) WITH CONTRIVED EXAMPLES

Reference
- Personal Reference
  1. Personal pronouns--Generally only third person, we occasionally.
     a. John has moved to a new house. He built it himself.
     b. My husband and I are leaving. We have had enough of this.
  2. Possessive determiners
     a. John bought a new house. His wife must be thrilled.
  3. Possessive pronouns
     a. That new house is John's. I didn't know it was his.
- Demonstrative Reference
  1. Nominal demonstratives--this, these, that, those
     a. They broke a vase. That was careless.
  2. Definite noun phrase--the
     a. A big dog was in our path. As we approached, the dog started growling.
  3. Demonstrative adverbs--here, there, now, then
     a. I've been invited to the party tonight. I'll see you there.
     b. I remember my childhood well. We had very little money then.
- Comparative Reference
  1. Mr. Jones is a man of intense pride. Such men do not like the thought of welfare.
  2. Why does a mere $10,000 cause so much concern? Bigger rackets go on every day.
  3. I've never seen dancers so uncertain on their feet; they were tripping all over one another.

Substitution
- Nominal
  1. One/ones--I like the new director. This one knows his job.
  2. Same--Sam is ordering a steak. I'll have the same.
- Verbal--do
  1. I finally called him. Having done so I feel better.
- Clausal--so
  1. It's going to rain. At least the radio says so.

Ellipsis
- Nominal
  1. Specific Deictic
     a. All--The men did not return until after midnight. All Ø were tired from the ordeal.

b. Both--The parents could not be reached. Both ∅ were out of the country.

2. Nonspecific Deictics--each, every, any, some
   a. There are ten apartment complexes. Each ∅ is owned by a large corporation.
3. Numeratives
   a. Jim was the first person there. I was the second.
4. Epithet or Classifier
   a. Joe prefers strong coffee. Weak ∅ is better to me.

Verbal ellipsis
1. Lexical--ellipsis from the end of a verbal
   a. I cannot come, but Charles will.
   b. Is John going?. He should.
2. Operator--ellipsis from left portion of the verbal
   a. Has Mary been crying? No, laughing.

Clausal Ellipsis
1. Frank has not sold all his raffle tickets. She has ∅.
2. What has Mark been making? ∅ A birdhouse.

Conjunction

Additive--and, or, furthermore, incidentally
1. He had to walk the entire way back to town. And in all that time he did not see a soul
2. Maybe she is just running late. Or perhaps she had an accident.

Adversative--but, yet, though, only, however, despite this, instead, rather, anyhow
1. She failed this time. However, she didn't give up.
2. The total was wrong. Yet we checked the figures.

Causal--so, thus, hence, therefore, consequently
1. There wasn't much time. So she got to work at once.
2. Ted had to go to Atlanta. Therefore he will not make his appointment.

Temporal--then, next, simultaneously, earlier
1. You put the top on. Then you turn it over.
2. Good nutrition is important for four reasons. First,...

Continuatives--now, of course, well, anyway, surely
1 Are you ready? Now when I say go, you jump.
2. They were going to meet me. Of course they may have changed their minds.

Lexical Cohesion
1. Repetition of the same word or word with similar root
   a. He's climbing the old oak. That oak isn't very safe.
2. Synonym
   a. I'm very angry with him. I don't get mad very often.
3. Superordinate
   a. He's climbing the old oak. That tree isn't safe.
4. General term
   a. I read his report. The whole thing is inaccurate.

# APPENDIX J
# FORM FOR CODING CONTENT AND COHESION MEASURES

| | 1-1 | 1-2 | 1-3 | 2-1 | 2-2 | 2-3 | 3-1 | 3-2 | 3-3 | 4-1 | 4-2 | 4-3 | 5-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Accurate content units | | | | | | | | | | | | | |
| Inaccurate content units | | | | | | | | | | | | | |
| Problems in clarity | | | | | | | | | | | | | |
| 1. Vague clauses | | | | | | | | | | | | | |
| 2. Indefinite words | | | | | | | | | | | | | |
| 3. Exophoric reference | | | | | | | | | | | | | |
| 4. Errors with pronouns | | | | | | | | | | | | | |
| 5. Paraphasias | | | | | | | | | | | | | |
| Reference Cohesion | | | | | | | | | | | | | |
| 1. Personal | | | | | | | | | | | | | |
| 2. Demonstrative | | | | | | | | | | | | | |
| 3. Comparative | | | | | | | | | | | | | |
| Substitution Cohesion | | | | | | | | | | | | | |
| 1. Nominal | | | | | | | | | | | | | |
| 2. Verbal | | | | | | | | | | | | | |
| 3. Clausal | | | | | | | | | | | | | |
| Ellipsis Cohesion | | | | | | | | | | | | | |
| 1. Nominal | | | | | | | | | | | | | |
| 2. Verbal | | | | | | | | | | | | | |
| 3. Clausal | | | | | | | | | | | | | |
| Conjunction Cohesion | | | | | | | | | | | | | |
| 1. Additive | | | | | | | | | | | | | |
| 2. Adversative | | | | | | | | | | | | | |
| 3. Causal | | | | | | | | | | | | | |
| 4. Temporal | | | | | | | | | | | | | |
| 5. Continuative | | | | | | | | | | | | | |
| Lexical Cohesion | | | | | | | | | | | | | |
| 1. Repetition | | | | | | | | | | | | | |
| 2. Synonym | | | | | | | | | | | | | |
| 3. Superordinate | | | | | | | | | | | | | |
| 4. General | | | | | | | | | | | | | |

## APPENDIX K-1
## RAW SCORES ON WESTERN APHASIA BATTERY (KERTESZ, 1982) FOR EXPERIMENTAL SUBJECTS

| | Spontaneous Speech | | Aud Comprehension | | | | Naming | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Subject | Content | Fluency | Y/N | Word | Commands | Repetition | Object | WdFl | SC | RS |
| 1 | 7 | 6 | 60 | 60 | 80 | 96 | 60 | 8 | 10 | 10 |
| 2 | 10 | 9 | 60 | 60 | 80 | 96 | 60 | 10 | 10 | 9 |
| 3 | 6 | 8 | 54 | 51 | 36 | 92 | 27 | 6 | 10 | 8 |
| 4 | 6 | 6 | 54 | 54 | 74 | 90 | 55 | 8 | 6 | 10 |
| 5 | 10 | 9 | 60 | 60 | 80 | 100 | 60 | 14 | 10 | 10 |
| 6 | 8 | 9 | 60 | 60 | 70 | 99 | 56 | 9 | 8 | 8 |
| 7 | 10 | 9 | 60 | 59 | 80 | 100 | 58 | 16 | 10 | 10 |
| 8 | 10 | 9 | 60 | 58 | 80 | 100 | 58 | 17 | 10 | 10 |
| 9 | 10 | 9 | 60 | 60 | 80 | 93 | 56 | 13 | 10 | 8 |
| 10 | 10 | 9 | 60 | 58 | 80 | 100 | 57 | 15 | 10 | 10 |
| 11 | 10 | 9 | 60 | 60 | 66 | 98 | 57 | 9 | 10 | 10 |

Y/N = Yes/No Question
Word = Auditory Word Recognition
Object = Object Naming

WdFl = Word Fluency
SC = Sentence Completion
RS = Responsive Speech

APPENDIX K-2
SCORES ON SUBTESTS OF WECHSLER MEMORY SCALE (WECHSLER, 1945) AND APHASIA QUOTIENT (KERTESZ, 1982) FOR EXPERIMENTAL SUBJECTS

| Subject | Memory Subtests | | | Memory Total | Aphasia Quotient |
|---|---|---|---|---|---|
| | Logical Memory | Digits Forward | Digits Backward | | |
| 1 | 3.5 | 5 | 3 | 11.5 | 82.8 |
| 2 | 6 | 5 | 5 | 16 | 94.8 |
| 3 | 2.5 | 4 | 3 | 9.5 | 70.6 |
| 4 | 0.5 | 4 | 0 | 4.5 | 76.0 |
| 5 | 7 | 7 | 0 | 14 | 96.8 |
| 6 | 2.5 | 8 | 3 | 13.5 | 89.0 |
| 7 | 11 | 5 | 4 | 20 | 96.6 |
| 8 | 11 | 5 | 5 | 21 | 96.8 |
| 9 | 11.5 | 7 | 5 | 23.5 | 94 |
| 10 | 11.5 | 6 | 6 | 23.5 | 96.2 |
| 11 | 3.5 | 6 | 3 | 12.5 | 93.4 |

APPENDIX K-3
SCORES ON SUBTESTS OF
WECHSLER MEMORY SCALE (WECHSLER, 1945) FOR CONTROL SUBJECTS

| Subject | Logical Memory | Digits Forward | Digits Backward | Total |
|---|---|---|---|---|
| 1 | 7.5 | 7 | 5 | 19.5 |
| 2 | 12.5 | 8 | 7 | 27.5 |
| 3 | 12.0 | 5 | 3 | 20.0 |
| 4 | 13.5 | 6 | 5 | 24.5 |
| 5 | 11.5 | 8 | 5 | 24.5 |
| 6 | 13.0 | 6 | 5 | 24.0 |
| 7 | 11.0 | 8 | 5 | 24.0 |
| 8 | 14.0 | 7 | 5 | 26.0 |
| 9 | 13.0 | 8 | 5 | 26.0 |
| 10 | 13.5 | 7 | 5 | 25.5 |
| 11 | 6.5 | 6 | 7 | 19.5 |
| 12 | 7.5 | 6 | 5 | 18.5 |
| 13 | 15.0 | 8 | 7 | 30.0 |
| 14 | 16.0 | 8 | 7 | 31.0 |
| 15 | 5.0 | 7 | 6 | 18.0 |
| 16 | 11.0 | 7 | 4 | 22.0 |
| 17 | 8.5 | 6 | 4 | 18.5 |
| 18 | 14.5 | 5 | 5 | 24.5 |
| 19 | 7.0 | 4 | 3 | 14.0 |
| 20 | 10.0 | 5 | 3 | 18.0 |
| 21 | 11.0 | 7 | 6 | 24.0 |

# APPENDIX K-4
## RAW DATA FOR EXPERIMENTAL SUBJECTS: PRODUCTIVITY MEASURES

| Subject | Time (in sec) Task 1 | Time Task 2 | Time Task 3 | Number of Words Task 1 | Number of Words Task 2 | Number of Words Task 3 | Number of C-units Task 1 | Number of C-units Task 2 | Number of C-units Task 3 | Number Words per C-unit Task 1 | Number Words per C-unit Task 2 | Number Words per C-unit Task 3 | Syllables per sec Task 1 | Syllables per sec Task 2 | Syllables per sec Task 3 | % Syllables in Mazes Task 1 | % Syllables in Mazes Task 2 | % Syllables in Mazes Task 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 13 | 18 | 50 | 31 | 38 | 8 | 5 | 4 | 6.25 | 6.20 | 9.50 | 1.87 | 2.54 | 2.56 | 0.00 | 0.00 | 2.17 |
| 2 | 39 | 43 | 82 | 43 | 54 | 119 | 5 | 4 | 11 | 8.60 | 13.50 | 10.82 | 1.33 | 1.61 | 1.61 | 1.92 | 0.00 | 3.79 |
| 3 | 25 | 32 | 15 | 54 | 58 | 29 | 6 | 5 | 2 | 9.00 | 11.60 | 14.50 | 3.12 | 2.97 | 3.40 | 35.90 | 33.68 | 27.45 |
| 4 | 51 | 11 | 17 | 44 | 17 | 39 | 9 | 3 | 6 | 4.89 | 5.67 | 6.50 | 0.96 | 1.46 | 2.94 | 14.29 | 0.00 | 8.00 |
| 5 | 40 | 49 | 42 | 109 | 123 | 142 | 8 | 11 | 10 | 13.63 | 11.18 | 14.20 | 3.60 | 3.98 | 4.14 | 5.56 | 24.10 | 2.30 |
| 6 | 29 | 48 | 37 | 73 | 107 | 83 | 7 | 15 | 11 | 10.43 | 7.13 | 7.55 | 3.14 | 3.31 | 3.11 | 17.58 | 25.79 | 20.87 |
| 7 | 43 | 44 | 27 | 100 | 100 | 54 | 12 | 7 | 4 | 8.33 | 14.29 | 13.50 | 2.77 | 2.96 | 2.96 | 10.08 | 10.77 | 20.00 |
| 8 | 18 | 49 | 37 | 47 | 96 | 84 | 6 | 12 | 8 | 7.83 | 8.00 | 10.50 | 3.28 | 2.82 | 2.62 | 5.08 | 13.04 | 1.03 |
| 9 | 29 | 48 | 27 | 88 | 138 | 77 | 11 | 13 | 7 | 8.00 | 10.62 | 11.00 | 3.62 | 4.04 | 3.78 | 0.95 | 11.86 | 13.73 |
| 10 | 66 | 53 | 70 | 135 | 119 | 135 | 12 | 8 | 8 | 11.25 | 14.88 | 16.88 | 2.52 | 3.08 | 2.67 | 10.84 | 8.59 | 13.90 |
| 11 | 33 | 36 | 23 | 49 | 63 | 51 | 5 | 5 | 8 | 9.80 | 12.60 | 6.38 | 1.67 | 2.06 | 2.48 | 5.45 | 0.00 | 3.51 |

# APPENDIX K-5
## RAW DATA FOR CONTROL SUBJECTS: PRODUCTIVITY MEASURES

| | Time (in sec) | | | Number of Words | | | Number of C-units | | | Number Words per C-unit | | | Syllables per sec | | | % Syllables in Mazes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Task | | | Task | | | Task | | | Task | | | Task | | | Task | | |
| Subject | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| 1 | 22 | 34 | 34 | 79 | 111 | 146 | 10 | 9 | 13 | 7.90 | 12.33 | 11.23 | 4.41 | 4.09 | 4.65 | 4.12 | 6.47 | 3.80 |
| 2 | 39 | 37 | 44 | 124 | 125 | 137 | 13 | 9 | 13 | 9.54 | 13.89 | 10.54 | 3.80 | 4.14 | 3.71 | 8.11 | 1.96 | 9.20 |
| 3 | 53 | 48 | 67 | 178 | 155 | 228 | 18 | 14 | 23 | 9.89 | 11.07 | 9.91 | 4.23 | 4.27 | 4.49 | 4.02 | 2.44 | 4.65 |
| 4 | 19 | 25 | 34 | 62 | 81 | 81 | 5 | 7 | 7 | 12.40 | 11.57 | 11.57 | 3.95 | 4.04 | 2.97 | 0.00 | 0.99 | 7.92 |
| 5 | 60 | 45 | 139 | 150 | 143 | 350 | 10 | 9 | 21 | 15.00 | 15.89 | 16.67 | 3.13 | 3.89 | 3.32 | 1.60 | 0.57 | 6.93 |
| 6 | 24 | 34 | 30 | 96 | 104 | 111 | 12 | 11 | 11 | 8.00 | 9.45 | 10.09 | 4.42 | 3.97 | 4.43 | 0.00 | 5.93 | 5.26 |
| 7 | 40 | 35 | 51 | 90 | 86 | 96 | 9 | 7 | 11 | 10.00 | 12.29 | 8.73 | 2.70 | 3.20 | 2.18 | 2.78 | 5.36 | 4.50 |
| 8 | 62 | 42 | 70 | 133 | 106 | 186 | 12 | 7 | 21 | 11.08 | 15.14 | 8.86 | 2.94 | 3.31 | 3.97 | 8.24 | 3.60 | 1.80 |
| 9 | 26 | 37 | 68 | 78 | 117 | 241 | 6 | 7 | 10 | 13.00 | 16.71 | 24.10 | 3.89 | 4.19 | 4.32 | 8.91 | 3.22 | 5.10 |
| 10 | 18 | 25 | 42 | 57 | 77 | 138 | 6 | 7 | 13 | 9.50 | 11.00 | 10.62 | 3.61 | 4.12 | 4.05 | 3.08 | 8.74 | 5.88 |
| 11 | 41 | 50 | 58 | 117 | 111 | 149 | 6 | 6 | 10 | 19.50 | 18.50 | 14.90 | 3.59 | 2.90 | 3.10 | 2.72 | 0.69 | 4.44 |
| 12 | 39 | 43 | 49 | 90 | 107 | 107 | 6 | 7 | 5 | 15.00 | 15.29 | 21.40 | 2.77 | 3.42 | 2.96 | 0.00 | 6.12 | 4.14 |
| 13 | 19 | 28 | 47 | 63 | 87 | 64 | 4 | 7 | 7 | 15.75 | 12.43 | 9.14 | 3.84 | 4.07 | 3.02 | 0.00 | 0.00 | 9.15 |
| 14 | 54 | 44 | 54 | 109 | 106 | 163 | 11 | 8 | 9 | 9.91 | 13.25 | 18.11 | 2.78 | 3.09 | 3.52 | 16.00 | 5.88 | 7.89 |
| 15 | 35 | 36 | 54 | 93 | 106 | 143 | 4 | 7 | 8 | 23.25 | 15.14 | 17.88 | 3.34 | 3.97 | 2.87 | 7.69 | 7.69 | 6.45 |
| 16 | 48 | 37 | 56 | 156 | 111 | 157 | 10 | 9 | 12 | 15.60 | 12.33 | 13.08 | 3.67 | 3.73 | 3.34 | 0.57 | 0.72 | 5.35 |
| 17 | 38 | 42 | 71 | 82 | 88 | 177 | 8 | 9 | 18 | 10.25 | 9.78 | 9.83 | 2.66 | 3.07 | 3.24 | 2.97 | 9.30 | 9.57 |
| 18 | 28 | 38 | 49 | 90 | 129 | 193 | 9 | 10 | 12 | 10.00 | 12.90 | 16.08 | 3.68 | 4.237 | 4.86 | 1.94 | 3.11 | 2.94 |
| 19 | 40 | 24 | 60 | 120 | 77 | 205 | 13 | 6 | 16 | 9.23 | 12.83 | 12.81 | 4.28 | 4.67 | 4.43 | 6.43 | 10.71 | 4.51 |
| 20 | 89 | 42 | 104 | 205 | 88 | 233 | 14 | 9 | 12 | 14.64 | 9.78 | 19.42 | 3.32 | 3.07 | 3.06 | 3.73 | 9.30 | 4.09 |
| 21 | 30 | 40 | 73 | 83 | 76 | 202 | 5 | 8 | 10 | 16.60 | 9.50 | 20.20 | 3.50 | 2.50 | 3.36 | 0.00 | 7.00 | 3.67 |

# APPENDIX K-6

## RAW DATA FOR EXPERIMENTAL SUBJECTS: CONTENT MEASURES

| | Accurate Content Units | | | Inaccurate Content Units | | | Problems in Clarity | | |
|---|---|---|---|---|---|---|---|---|---|
| | Task | | | Task | | | Task | | |
| Subject | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| 1 | 2 | 3 | 6 | 4 | 1 | 0 | 1 | 1 | 0 |
| 2 | 4 | 7 | 4 | 1 | 1 | 0 | 0 | 1 | 4 |
| 3 | 0 | 0 | 2 | 6 | 3 | 0 | 5 | 5 | 2 |
| 4 | 4 | 0 | 2 | 0 | 2 | 3 | 1 | 0 | 2 |
| 5 | 10 | 12 | 6 | 0 | 0 | 0 | 1 | 0 | 3 |
| 6 | 6 | 4 | 6 | 1 | 5 | 1 | 1 | 18 | 5 |
| 7 | 2 | 11 | 4 | 5 | 0 | 0 | 5 | 0 | 2 |
| 8 | 3 | 11 | 6 | 1 | 0 | 0 | 1 | 0 | 0 |
| 9 | 9 | 12 | 3 | 0 | 2 | 0 | 3 | 1 | 3 |
| 10 | 10 | 12 | 7 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11 | 2 | 8 | 5 | 3 | 0 | 0 | 7 | 1 | 5 |

APPENDIX K-7
RAW DATA FOR CONTROL SUBJECTS: CONTENT MEASURES

| | Accurate Content Units | | | Inaccurate Content Units | | | Problems in Clarity | | |
|---|---|---|---|---|---|---|---|---|---|
| | Task | | | Task | | | Task | | |
| Subject | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| 1 | 10 | 11 | 7 | 0 | 0 | 0 | 0 | 3 | 0 |
| 2 | 10 | 12 | 7 | 0 | 0 | 0 | 0 | 0 | 4 |
| 3 | 9 | 12 | 6 | 0 | 0 | 0 | 1 | 0 | 0 |
| 4 | 9 | 11 | 4 | 0 | 0 | 0 | 0 | 0 | 2 |
| 5 | 10 | 12 | 7 | 0 | 0 | 0 | 0 | 0 | 3 |
| 6 | 9 | 11 | 7 | 0 | 1 | 0 | 1 | 0 | 1 |
| 7 | 10 | 11 | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | 10 | 12 | 7 | 0 | 0 | 0 | 0 | 0 | 4 |
| 9 | 9 | 12 | 6 | 0 | 0 | 0 | 0 | 0 | 1 |
| 10 | 5 | 10 | 7 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11 | 7 | 12 | 6 | 0 | 0 | 0 | 1 | 0 | 2 |
| 12 | 10 | 12 | 6 | 0 | 0 | 0 | 0 | 0 | 1 |
| 13 | 10 | 12 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 14 | 10 | 10 | 6 | 0 | 0 | 0 | 1 | 0 | 0 |
| 15 | 10 | 11 | 6 | 0 | 1 | 0 | 1 | 0 | 3 |
| 16 | 10 | 12 | 7 | 0 | 0 | 0 | 0 | 0 | 2 |
| 17 | 8 | 12 | 7 | 0 | 0 | 0 | 1 | 0 | 0 |
| 18 | 6 | 10 | 7 | 0 | 0 | 0 | 1 | 0 | 2 |
| 19 | 10 | 12 | 7 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20 | 10 | 12 | 7 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21 | 8 | 10 | 6 | 0 | 0 | 0 | 0 | 0 | 0 |

APPENDIX K-8
RAW DATA FOR EXPERIMENTAL SUBJECTS: COHESION MEASURES

| | Reference Cohesive Ties* | | | Substitution Cohesive Ties* | | | Ellipsis Cohesive Ties* | | |
|---|---|---|---|---|---|---|---|---|---|
| | Task | | | Task | | | Task | | |
| Subject | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| 1 | 1.00 | 1.00 | 0.25 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 1.20 | 1.25 | 0.27 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 0.50 | 1.00 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | 0.67 | 0.67 | 0.33 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5 | 1.75 | 1.64 | 0.30 | 0 | 0 | 0 | 0 | .09 | 0 |
| 6 | 1.29 | 0.20 | 0.46 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 1.25 | 2.29 | 0.75 | 0 | 0 | 0 | 0 | .14 | 0 |
| 8 | 0.83 | 1.25 | 0.25 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 | 0.64 | 1.39 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 2.00 | 1.63 | 0.13 | 0 | 0 | .13 | 0 | 0 | 0 |
| 11 | 1.40 | 0.80 | 0.25 | 0 | 0 | .13 | 0 | 0 | 0 |

*Cohesive ties per C-unit

APPENDIX K-8--extended

| Conjunction Cohesive Ties* | | | Lexical Cohesive Ties* | | |
|---|---|---|---|---|---|
| Task | | | Task | | |
| 1 | 2 | 3 | 1 | 2 | 3 |
| .87 | .40 | .75 | .13 | 0.20 | 0.25 |
| .60 | .25 | .64 | .40 | 1.25 | 0.55 |
| .17 | .80 | .50 | .33 | 1.20 | 1.0 |
| .22 | .33 | 0 | .11 | 0.0 | 0.0 |
| .50 | .73 | .50 | 1.50 | 1.27 | 1.20 |
| .86 | .80 | .91 | .57 | 0.53 | 0.55 |
| .83 | .71 | .75 | .67 | 1.29 | 0.25 |
| .83 | .92 | .88 | .33 | 1.0 | 1.0 |
| .82 | .77 | .71 | .36 | 1.23 | 0.29 |
| .92 | .88 | .63 | 1.08 | 1.63 | 1.25 |
| .60 | .80 | .75 | 1.20 | 1.60 | 0.13 |

# APPENDIX K-9
## RAW DATA FOR CONTROL SUBJECTS: COHESION MEASURES

| Subject | Reference Cohesive Ties[a] Task 1 | 2 | 3 | Substitution Cohesive Ties[a] Task 1 | 2 | 3 | Ellipsis Cohesive Ties[a] Task 1 | 2 | 3 | Conjunction Cohesive Ties[a] Task 1 | 2 | 3 | Lexical Cohesive Ties[a] Task 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.10 | 0.78 | 1.00 | 0 | 0 | 0 | 0 | 0 | 0 | .90 | .89 | .85 | .80 | 1.33 | 1.00 |
| 2 | 1.62 | 1.89 | .69 | 0 | 0 | 0 | 0 | 0 | 0 | .92 | .89 | .85 | .54 | 1.22 | .39 |
| 3 | 1.94 | 1.00 | .39 | 0 | 0 | .04 | 0 | 0 | .09 | .78 | .86 | .87 | 1.44 | 1.57 | .78 |
| 4 | 1.00 | 2.00 | .29 | 0 | 0 | 0 | 0 | 0 | 0 | .40 | .86 | .57 | 1.00 | 1.29 | .57 |
| 5 | 2.20 | 2.00 | .43 | 0 | 0 | 0 | 0 | 0 | 0 | .50 | .78 | .76 | 1.70 | 2.11 | 1.62 |
| 6 | 1.17 | 1.36 | .09 | 0 | 0 | 0 | 0 | 0 | 0 | .83 | .82 | .82 | .83 | 1.18 | .91 |
| 7 | 0.78 | 1.86 | .36 | 0 | 0 | 0 | 0 | 0 | 0 | .56 | .86 | .73 | .78 | 1.29 | .73 |
| 8 | 1.17 | 1.57 | .52 | 0 | 0 | 0 | 0 | 0 | 0 | .67 | .71 | .81 | .92 | 1.43 | .81 |
| 9 | 2.00 | 2.14 | .20 | 0 | 0 | 0 | 0 | 0 | 0 | .67 | .86 | .90 | 1.00 | 2.14 | 1.70 |
| 10 | 1.33 | 2.00 | .69 | 0 | 0 | 0 | 0 | 0 | 0 | .83 | .71 | .92 | 1.00 | 1.43 | .23 |
| 11 | 1.67 | 1.83 | .50 | 0 | 0 | 0 | 0 | 0 | 0 | .83 | .83 | .70 | 1.00 | 2.17 | 1.00 |
| 12 | 1.33 | 1.57 | .0 | 0 | 0 | 0 | 0 | 0 | 0 | .83 | .86 | .60 | 1.00 | 1.71 | .60 |
| 13 | 1.25 | 1.29 | .0 | 0 | 0 | 0 | 0 | 0 | 0 | .75 | .57 | .14 | .25 | 1.71 | .29 |
| 14 | 1.36 | 2.13 | .56 | 0 | 0 | 0 | 0 | 0 | .22 | .46 | .88 | .67 | .82 | 1.50 | 1.11 |
| 15 | 1.75 | 2.29 | .38 | 0 | 0 | 0 | 0 | 0 | 0 | .75 | .86 | 1.00 | .75 | 2.57 | .63 |
| 16 | 2.00 | 1.56 | .25 | 0 | 0 | .08 | 0 | 0 | 0 | .80 | .56 | .75 | 1.10 | 1.78 | 1.50 |
| 17 | 1.50 | 1.33 | .61 | .13 | 0 | 0 | 0 | 0 | 0 | .75 | .89 | .89 | .50 | 1.56 | .61 |
| 18 | 1.89 | 1.70 | .67 | 0 | 0 | .08 | 0 | 0 | 0 | .89 | 1.00 | .92 | .11 | .90 | .58 |
| 19 | 1.46 | 1.83 | .69 | .08 | 0 | 0 | 0 | 0 | 0 | .92 | .83 | .56 | 1.00 | 1.50 | 1.31 |
| 20 | 1.71 | 1.44 | .67 | 0 | 0 | 0 | 0 | 0 | 0 | .71 | .89 | .83 | 1.64 | 1.56 | 1.92 |
| 21 | 2.00 | 0.88 | .30 | 0 | 0 | 0 | 0 | 0 | 0 | .40 | .88 | .80 | 1.00 | 1.13 | 2.30 |

[a] Cohesive ties per C-unit

APPENDIX L-1
PROFILE ONE OF DISCOURSE PERFORMANCE:
TRANSCRIPT OF DISCOURSES FROM SUBJECT 1

Task #1: A man was very angry/ . . . . and he went around the corner to a bank/ . . and he knocked on front door and his wife let him in/ . and the dog was right behind him/ and they both went into the house and they shut the door/ . and he kissed her hand/

Task #2: A boy named Roger wanted to catch a bus/ he got on a bus/ and he gave a beggar his money but he couldn't get it back/ . that's all/

Task #3: You go to the grocery store and go up and down the aisle and fi-decide what you want/ . . . {"Anything else?} then you check out at the register/ and you pay for the groceries then you put them in your car/

# APPENDIX L-2
## PROFILE TWO OF DISCOURSE PERFORMANCE: TRANSCRIPT OF DISCOURSES FROM SUBJECT 3

Task #1: Well, the dog came to the-came to the store/ and uh he couldn't get up he couldn't get in/ he didn't have the right-he didn't have the right thing so when the-when the lady uh spoke to him and kissed him, they let him-they let the dog out/ {"Look all the way over here to the left side, too. I'm not sure you see the whole cartoon."} ["Yeah. I see the whole cartoon."] {"Can you tell me anything more about the pictures?"} ["What? The cartoon?"] {"Uh-huh."} Well, the-the-the-the-the dog is-is mad 'cause he can't uh he can't find a way to get up-get-get his stuff/

Task #2: Well, I just heard that a . a fella was going to come into town/ and he and he uh . somebody couldn't give him a l-give him a ride/ and they give him a-a dollar-they give him s-s-sixty-five cent to catch the bus to go to-to go to ride/ and when he-he woke up,I mean, he got up and say that-that those two-they didn't-they didn't give him enough money/ so he couldn't ride the bus/

Task #3: When you buy groceries you got to-got to go to the grocery store/ and after you go to the grocery store, you-you uh . go to-go to the line up and uh and-and get the-get the st-get the stuff/ . . {Anything else?} [No, that's all.]

# APPENDIX L-3
# PROFILE THREE OF DISCOURSE PERFORMANCE: TRANSCRIPT OF DISCOURSES FROM SUBJECT 10

Task #1: Okay . . . all right/ this man is walking by a building and . a-a vase with a flower falls on his head/ and he's with his dog and his cane/ and he's angry and waves his fist at-at the uh the upstairs apartment from where the flower pot's been dropped on his head/ and then he goes inside and . uh knocks on the door with-with his cane and his dog is with him/ and uh . a woman opens the door and sees the dog outside and gives the dog a bone/ . and uh she's very nice to the dog and so the man is kindof charmed by her and takes off his hat . uh . uh you know to be polite to her and his-his uh . bump on his head is showing and he kisses the lady's hand and the dog runs off with the bone/

Task #2: Okay/ one night, Roger was s-standing by the side of the road waiting for . a uh a bus and a beggar came up and uh asked him for some money and Roger was feeling very kindly towards the wer-world and he emptied his pockets and uh . gave the beggar all of his money and the beggar chuffled- beggar shuffled off/ and then, Roger realized that he didn't have any money for his bus fare, fifty cents, two quarters, that he needed for his bus fare so he went running after the beggar and uh asked him to-to give him two quarters for his bus fare/ and the beggar smiled at him and said that he'd be glad to sell him two quarters for a dollar/

<u>Task #3</u>: m Okay/ the best thing to do is first to write a list um of-of foods that you want to eat/ uh plan-plan maybe a week's menu and then write down uh the-the ingredients or the uh the items you'll need to buy to make those-those meals for your week/ then go to the supermarket and . uh get a basket and walk down um . the aisles and-and pick out the-the foods that are on your list . and uh compare the prices . uh the . the uh items straight ahead probably won't be the cheapest ones, the ones on the bottom of the shelf will be cheaper/ [laugh] and . once-once you've gotten all your uh items together, then stand in line at the register and pay the uh cashier the-the money for the food then go out to your car and load your groceries on th-in the car/ then go home/

APPENDIX L-4
TRANSCRIPT OF DISCOURSES FROM CONTROL SUBJECT 16

Task #1: This . elderly man is walking his dog in front of a building/ and a plant falls from some kind of balcony or . overhang and lands on top of his head/ well, he looks up and he shouts up there to whoever's up there/ and . chews them out for dropping it or making that thing land on his head/ and he goes in the door and up the stairs and starts pounding on the door/ and this nice woman comes out and pets his little doggie on the head and gives him a bone and is being real friendly and the man just doesn't know what to do/ he's just stunned/ and so he . he just can't yell at her after being so good to his dog/ and takes her by the hand and tips his hat and gives her a kiss on the hand/ and his little doggie runs away with the bone/

Task #2: Roger is on the outskirt of a town, waiting for a bus/ a beggar comes by and asks him for some change/ and Roger was feeling real good about the world/ and he reaches into his pocket and gives the beggar all of his change/ the beggar then walks away and then Roger realizes what he's done/ he's given the beggar the money he needs for the bus, which was fifty cents/ Roger calls the beggar back/ and asks him for some money and tells him what-what the problem is, why he needs the money back/ and the beggar says "I'll sell you fifty cents for a dollar/"

<u>Task #3:</u> When you first walk in the door, you're going to grab a shopping cart/ and . start walking down the aisles/ we usually go to the first ones, uh directly in front of you/ and look down the aisles and choose the items that you want/ and go up and down all the other aisles and see what you want/ uh after you've completed picking out the items you want then you will take your shopping cart to the cashiers and take the items out of your cart and put them on the little uh . . what is that called . the uh counter, if you want to say that/ and the clerk will take your products and run them over the little thing, if that's what they've got/ or she'll put the numbers in and-and tell you what your total is/ and you'll pay her/ and they'll bag your groceries/ and you'll take your groceries out/ and you're done!

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## BIOGRAPHICAL SKETCH

Leila Hartley Wyckoff was born in Swainsboro, Georgia, in 1950. After graduating from Swainsboro High School in 1968, she attended Oxford College, a two-year division of Emory University. There she was elected to Who's Who in American Junior Colleges and to the Student Senate.

Ms. Wyckoff continued her undergraduate studies at the Atlanta campus of Emory University where she was tapped into Phi Beta Kappa. After receiving a Bachelor of Arts degree in psychology in June 1972, she began her graduate studies in speech pathology. Ms. Wyckoff earned her Master of Medical Science degree from Emory University School of Medicine in 1974.

For two years, Ms. Wyckoff worked as a speech-language pathologist at the Speech and Hearing Center in Jacksonville, Florida, obtaining her Certificate of Clinical Competence and her state license in speech pathology. From May 1976 to May 1979 she worked at Cathedral Health and Rehabilitation Center, serving as the head of the department of speech pathology for two of those years. During this period, she developed new services for head trauma patients, wrote the policy and procedure manual for the department, developed a program

evaluation for the speech pathology department, and represented the department at Rehabilitation Team conferences.

An interest in the complex nature of the behavioral, cognitive and language problems which follow head trauma led Ms. Wyckoff to seek additional education. She entered the doctoral program of the Speech Department of the University of Florida in 1979, specializing in speech pathology and minoring in neuropsychology. While pursuing her doctorate, she also worked part-time in private practice with Dr. Michelle W. Jensen. In 1983 she helped form a Gainesville branch of the National Head Injury Foundation. She was awarded her Doctor of Philosophy degree in April, 1984.

This dissertation was submitted to the Graduate Faculty of the Department of Speech in the College of Liberal Arts and Sciences and to the Graduate School, and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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